ED 328 478 SO 021 056

AUTHOR Haupt, Arthur; Kane, Thomas T.
TITLE The Population Reference Bureau's Population Handbook. A Quick Guide to Population Dynamics for Journalists, Policymakers, Teachers, Students, and Other People Interested in People. Second Edition.
INSTITUTION Population Reference Bureau, Inc., Washington, D.C.
REPORT NO ISBN-0-917136-09-8
PUB DATE 88
NOTE 74p.; Two-tone graphs will not reproduce clearly.
AVAILABLE FROM Population Reference Bureau, Inc., 1875 Connecticut Avenue, N.W., Suite 520, Washington, DC 20009 ($5.00 each, plus $1.00 shipping).
PUB TYPE Guides - General (050) -- Reports - Research/Technical (143) -- Statistical Data (110)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Demography; Developing Nations; Global Approach; Instructional Materials; *Population Education; Reference Materials; Secondary Education; Social Studies; Statistical Data; Tables (Data); *Womens Education; Womens Studies; *World Problems

ABSTRACT

Demography is the scientific study of populations. Population change has an impact on every facet of life. This revised handbook contains additional information on how to calculate the total fertility rate and life tables. The purpose of the handbook is to clarify and explain demographic terminology, to aid public understanding, and to assist policymakers, teachers, students, and others who need to understand, cite, and utilize population information. Major areas covered are: (1) age and sex composition; (2) fertility; (3) mortality; (4) morbidity; (5) nuptiality; (6) migration; (7) urbanization and distribution; and (8) population change. A glossary, censuses, surveys, and population information sources also are appended. (NL)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED328478

2ND EDITION

# POPULATION HANDBOOK

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

R.
WORRALL

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SO 021 056

A Quick Guide to Population Dynamics
for Journalists, Policymakers, Teachers,
Students, and Other People Interested in People

BEST COPY AVAILABLE

2ND EDITION

The Population Reference Bureau's

# POPULATION HANDBOOK

By Arthur Haupt and Thomas T. Kane

**Population Reference Bureau, Inc.**
Washington, D.C.

**Copyright© 1978, 1985, 1988 by the Population Reference Bureau, Inc.**

**second edition**

**Printed in U.S.A.**

**Sixth printing, 1988**

**Library of Congress Cataloging in Publication Data**

Haupt, Arthur, 1945-
The Population Reference Bureau's population handbook. (Second edition)

1. Population – Handbooks, manuals, etc.
2. Demography – Handbooks, manuals, etc. I. Kane, Thomas T., 1951- II. Population Reference Bureau. III. Title. IV. Title: Population handbook.
HB871.H357 1985 304.6'02'02 85-19555
ISBN 0-917136-09-8

**Other Handbook editions:** The POPULATION HANDBOOK is also published in an International Edition (in English), a Caribbean-oriented edition (in English) and in Arabic, French, and Spanish language editions. Contact PRB for prices.

**PRB membership rates:** Individual memberships are $40 per year, with a 30 percent discount to educators* ($28) and 50 percent discount ($20) to students*; library and nonprofit institutions are $50 per year.

*Educators and students please enclose supporting documentation.

## Contents


ABOUT POPULATION ..... 5
AGE AND SEX COMPOSITION ..... 9
FERTILITY ..... 17
MORTALITY ..... 27
MORBIDITY ..... 34
NUPTIALITY ..... 37
MIGRATION ..... 39
URBANIZATION AND DISTRIBUTION ..... 42
POPULATION CHANGE ..... 46
APPENDIX ..... 55
- Glossary ..... 57
- Censuses, Surveys, etc. ..... 66
- Population Information Sources ..... 68

FEATURES
- The Tools of Demography ..... 8
- Calculating the Total Fertility Rate ..... 21
- How Life Tables Work ..... 33

## Acknowledgments
## For the Second Edition

Since its publication in 1978, PRB's POPULATION HANDBOOK has gone through four printings. In recent years, special HANDBOOK editions have appeared in five languages, and students in many countries have used it in their classwork – in such fields as population, sociology, geography, and urban studies. Journalists have referred to it when writing the many population-related articles now appearing in the news. And those interested in population have found it a ready reference to the rates, ratios, and concepts of demography.

The HANDBOOK has now been extensively revised and updated for this new Second Edition. The statistical examples reflect the latest available data, and new sections have been added on how to calculate the total fertility rate and the life table.

Carl Haub, PRB's Director of Demographic Analysis and Public Information, was the Editor in charge of the HANDBOOK revision, as he was on the foreign language editions. Without his efforts, there would be no Second Edition, and we express our special appreciation to him.

We also express our appreciation to Leon F. Bouvier, who prepared the draft that was the foundation of the original HANDBOOK. And we thank those who reviewed the original first edition and whose comments contributed to its development, and the Ford Foundation, whose grant assisted its publication.

The figures in this edition were drawn by George Hager; special graphics design was prepared by Brenda Roth.

A.H. T.T.K.

August 1985

# About Population

*There is simply nothing so important to a people and its government as how many of them there are, whether their number is growing or declining, how they are distributed as between different ages, sexes (different groups are different in this regard), and different social classes and racial and ethnic groups, and again, which way these numbers are moving. . . .*

*If I were to be asked which are the most important qualities a young man or woman can bring to public life, and the participation in public affairs, I would say, first, a sound knowledge of English composition; second, a modestly exact acquaintance with the birth rate.*

Daniel Patrick Moynihan,
Senator from New York,
at Commencement Exercises of
the Capitol Page School, June 6, 1977

---

In the 30 seconds it took you to read Senator Moynihan's population declaration, some 135 live babies were born into the world. Some 50 people died during the same half minute, and the world thus experienced a net increase of 85 new inhabitants.

This translates into an addition of about 90 million people each year, on a planet which on July 1, 1985, had an estimated population of 5,128,000,000.

Everyone is a member of a population, and population changes affect all of us in one way or another.

Population change has an impact on every facet of life, from nationwide settlement patterns to the prices we pay. The recent "aging" of populations, both in the U.S. and Europe, has had reverberations in the baby food industry and in educational services, as well as in crime rates and the job market. Immigration has played a major role in shaping U.S. population. About one-half million immigrants enter the U.S. legally each year and signs and billboards in other languages – such as Chinese or Spanish – attest to the country's "melting pot" heritage.

Historical events in turn can have a significant impact on populations. Wars can decimate a generation of men, as has happened in the Soviet Union, France, and other countries during the 20th century. A raised standard of living can result in a lowering of birth rates. Improved medical care eventually becomes manifest in increasing life expectancy and changing causes of death, while subtle environmental contamination may first be detected by rising mortality or illness in certain geographic areas.

In all these ways and more, population is news. But unlike more anecdotal stories of world events, population stories are most meaningfully told in terms of numbers and rates. It is not enough to say, "Crime is rampant," or "People are feeling prosperous these days." These stories must be quantified with precise data – How many? Where? Which sex? What proportion of the population? Over what time period? And these data must be expressed clearly and represented to mean no more than they actually mean.

Such care is not always taken. Occasionally the media report a *birth* rate as a *growth* rate. (A birth rate is only part of a growth rate, as we shall see.) Worse, a declining growth rate has sometimes been reported as though it meant that the population is declining. (But even if its growth rate declines from 3 to 2 percent, a population is still growing rather rapidly).

Demography is the scientific study of populations. Demographers diligently scour the world for old and new data – using censuses, birth and death records, surveys, visa issuance records, even such sources as motor vehicle and school registrations. These data are analyzed and shaped into manageable form as either raw figures or rates, ratios, and other statistics. Most of the principal measures used in demography are defined on the fol-

Library of Congress

lowing pages, together with current examples of their use. A population glossary and an extensive list of information sources (including phone numbers) are also provided.

The purpose of the POPULATION HANDBOOK is to clarify and explain demographic terminology in order to aid public understanding and to assist journalists, policy makers, teachers, students, and others who need to understand, cite, and communicate population facts. The staff of the Population Reference Bureau hopes that this Handbook will prove a useful guide to some of humanity's most fundamental concerns.

## The Tools of Demography

**Count.** The absolute number of a population or any demographic event occurring in a specified area in a specified time period (e.g., 3,614,000 live births in the U.S. in 1983). The raw quantities of demographic events are the basis of all other statistical refinements and analyses.

**Rates.** The frequency of demographic events in a population in a specified time period (e.g., birth rate: 15.5 live births per 1,000 population in the U.S. in 1983). Rates tell how frequently an event is occurring – how common it is. *Crude rates* are rates computed for an entire population. *Specific rates* are rates computed for a specific subgroup – usually the population at risk of having the event occur (e.g., general fertility rate: births per 1,000 women aged 15-44 years). Thus, rates can be age-specific, sex-specific, race-specific, occupation-specific, etc.

**Ratio.** The relation of one population subgroup to another subgroup in the same population; that is, one subgroup divided by another (e.g., sex ratio: 95 males per 100 females in the U.S. in 1983).

**Proportion.** The relation of a population subgroup to the entire population; that is, a population subgroup divided by the entire population (e.g., the proportion married: 60 percent of the total U.S. population ages 15 and over were currently married in 1983).

**Constant.** An unchanging, arbitrary number (e.g., 100 or 1,000 or 100,000) by which rates, ratios, or proportions can be multiplied to express these measures in more understandable fashion. For example, 0.0155 live births per person occurred in the U.S. in 1983. Multiplying this rate by a constant (1,000) gives the same statistic in terms of 1,000 people, a clearer way of expressing the same thing: There were 15.5 births per 1,000 population. Most rates are expressed "per 1,000 population." In the formulas on the following pages, "**K**" means constant.

**Cohort Measures.** Statistics that measure events occurring to a *cohort* – a group of people sharing a common demographic experience who are observed through time. The most commonly used cohort is the *birth cohort* – people born in the same year or period. Other kinds of cohorts include marriage cohorts, school class cohorts, etc.

**Period Measures.** Statistics that measure events occurring to all or part of a population during one period of time – "taking a snapshot" of a population, in effect (e.g., the death rate of the whole U.S. population in 1983).

# Age and Sex Composition

*Age and sex are the most basic characteristics of a population. Every population has a different age and sex composition – the number or proportion of males and females in each age group – and this structure can have considerable impact on its demographic and socioeconomic situation, both present and future.*

---

**"Young" and "Old" Populations**

Some populations are relatively young, with a large proportion of people in the young ages – an industrial boom town with a large proportion of young workers and their families would be an example. Other populations are relatively old – such as a Florida retirement community. These two communities have markedly different age compositions; as a consequence, they would also have different proportions of the population in the labor force or in school, as well as different medical needs, consumer preferences, and even crime patterns. Obviously, a population's age structure has a great deal to do with how that population lives.

In general, developing countries have relatively young populations while most developed countries have old or "aging" populations. In many developing countries almost half the population is under 15 years old while less than 3 percent may be 65 or over. In most developed countries, on the other hand, less than 25 percent of the population is under 15, and 15 percent may be 65 or over.

**Median Age**

The age at which exactly half the population is older and half is younger is a population's median age.

**"The median age of the U.S. population in 1983 was 30.9 years."**

*The median age of Jordan in 1980 was 15, a young population, while that of West Germany was 37, an old population.*

**Sex Ratio**

The sex ratio is the ratio of males to females in a given population, usually expressed as the number of males for every 100 females.

The sex ratio at birth in most countries is about 105 or 106 males per 100 females. After birth, sex ratios vary, because of different patterns of mortality and migration for males and females within the population.

$$\frac{\text{Number of males}}{\text{Number of females}} \times K = \frac{114{,}179{,}000}{120{,}317{,}000} \times 100 = 94.9$$

**"In 1983 there were 95 males per 100 females in the U.S. population."**

*The U.S. sex ratio of 65-year-olds was 83 in 1983; at age 85 and over it was down to 41.*

**Age-Dependency Ratio**

The age-dependency ratio is the ratio of persons in the "dependent" ages (under 15 and over 64 years) to those in the "economically productive" ages (15-64 years) in a population.*

Where more detailed data are lacking, the age-dependency ratio is often used as an indicator of the economic burden the productive portion of a population must carry – even though some persons defined as "dependent" are producers and some persons in the

**The age-dependency ratio is sometimes divided into old-age dependency (the ratio of those aged 65 and over to those aged 15-64) and child dependency (the ratio of those aged under 15 to those aged 15-64).*

United Nations, G. Palmer

Frenchman with grandchildren

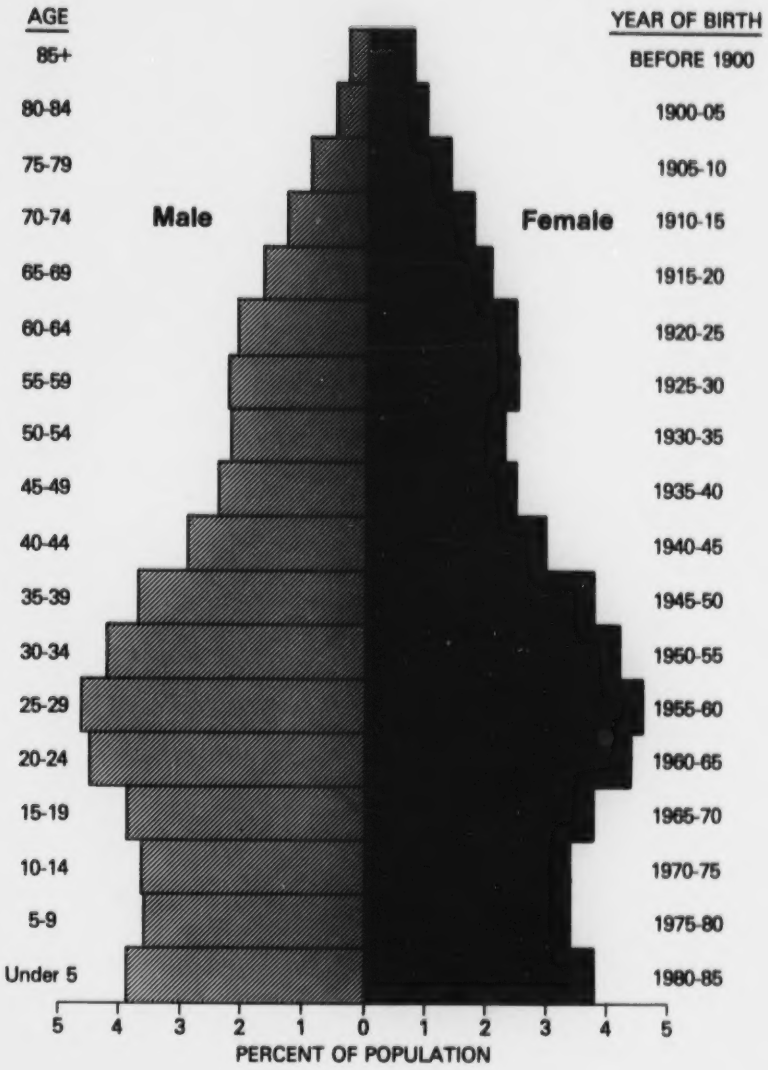
"productive" age range are economically dependent.

Countries with very high fertility usually have the highest age-dependency ratios because of the large proportion of children in the populations.

$$\frac{\text{Population under 15} + \text{Population 65 and over}}{\text{Population aged 15-64}} \times K = \frac{51,888,000 + 27,394,000}{155,894,000} \times 100 = 50.8$$

**"The age-dependency ratio in the U.S. in 1983 was 51. This means that there were 51 persons in the dependent ages for every 100 persons in the working ages."**

*By contrast, Syria had an age-dependency ratio of 104 in 1981; with 48 percent of its population under 15 years and 3 percent 65 and over. In Japan, the age-dependency ratio was only 47 in 1982, with 22 percent of its population under 15 years and 10 percent 65 and over.*




**Population Pyramid of the United States on July 1, 1985**

Source: U.S. Bureau of the Census.

**Population Pyramid**

A population pyramid graphically displays a population's age and sex composition. By showing numbers or proportions of males and females in each age group, the pyramid gives a vivid "picture" of a population's characteristics. The sum of all the age-sex groups in the population pyramid equals 100 percent of the population.

The pyramid on the opposite page displays the U.S. age-sex structure as projected for 1985. Each horizontal bar represents the size of an age-sex group. The bottom bar shows the percentage of males and females who were under 5 years of age in 1985; the bar located at age 30-34 on the pyramid represents all those alive and living in the U.S. in 1980 who were born 1950-1955; and so forth up to the pyramid's top, where very brief bars show the few surviving members of the birth cohorts born in 1900 and before. Each year a new cohort is born and "appears" at the bottom of the pyramid, while the cohorts above it move up. As the cohorts age, they inevitably lose members because of death, and may gain or lose because of migration. After age 45 this attrition process accelerates, causing the narrowing peak of all population pyramids.

Such a pyramid can tell a great deal about a population at a glance. Notice, for example, that females form the substantial majority in the oldest age groups. This is because in the U.S. females outlive males, on the average, by about seven years. Notice also the slight majority of males at the very youngest ages, because there are about 105 males born for every 100 females.

The pyramid's shape can give significant clues to a population's past and future. Look at the age groups 50-54 years old near the middle of the illustrated pyramid. This narrow section is the result of the sharply lowered birth rates of the 1930s, so that today these 1930s cohorts (now upwards of 50 years of age) are fewer in number than their 1920s predecessors, and much fewer that the post-World War II "baby boomers" (now in their early 20s to late 30s).

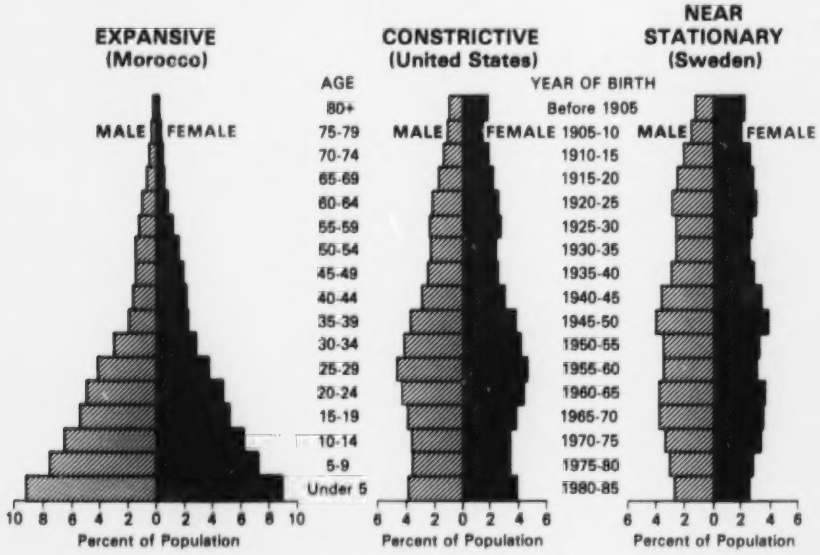
The wider bottom bar of the pyramid reflects the increased number of births during 1980-1985. This increase was due both to increases in the number of women of childbearing age as the "baby boom" matured and to some childbearing, delayed in the 1970s, evidencing itself in the early 1980s.

## The Three General Profiles

Populations of countries can differ markedly. However, they all tend to fall into three general profiles of age-sex composition.

1. **Expansive.** (Rapid growth) Larger numbers of people in the younger ages.
2. **Constrictive.** (Slow growth) Smaller numbers of people in the younger ages.
3. **Stationary.** (Near zero growth) Roughly equal numbers of people in all age ranges, tapering off gradually at the older ages.

As seen in the figure below, Morocco has an "expansive" population, with each cohort larger than the cohort born before it. In the U.S., recent cohorts have been progressively smaller, causing the age structure to change from "expansive" to "constrictive." And Sweden's population, with roughly equal numbers in all age ranges, can be classified as nearly "stationary."




**The Three General Profiles of Age Composition**

Source: Population Reference Bureau, using estimates for 1985

**Comparing Populations**

The likelihood of demographic events such as marriages or deaths obviously varies at different ages. Populations which have comparatively large numbers of elderly are likely to have more deaths and fewer births each year than will a suburb of equal size which is largely composed of young families. As a result, Sweden, with a large proportion of older persons compared to Mexico, will have more deaths per 1,000 population than Mexico.

When comparing populations (e.g., which country has higher fertility?), care should be taken that the age structure of the populations is not seriously affecting the comparison. *Crude* birth and death rates (see pages 17 and 27) are affected by the proportions of persons in the different ages and can give misleading comparisons (although the crude death rate is more likely to do so than the crude birth rate).

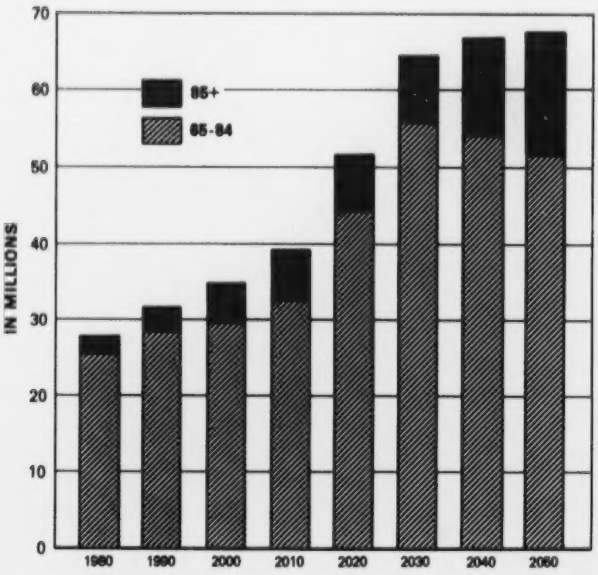
In order to make consistent comparisons, one can compare rates which are *age-specific*. One can compare the annual death rate for persons 60-64 in Mexico and the U.S. This is clearly unaffected by the *number* of persons 60-64 in either country and simply shows the probability of someone 60-64 in either country dying in a given year. Another way to compare populations is to *standardize* their overall rates. This procedure applies one country's age-specific rates to the age structure of a second country and answers this type of question: how many deaths would a country have had in a year if it had another's age structure?

**"The U.S. crude death rate was 8.5 deaths per 1,000 population in 1979. Mexico's crude death rate in 1979 was 6.2. However, if Mexico's age structure were the same as the U.S.'s in that year, its standardized (age-adjusted) death rate would equal 11.2, higher than the U.S.'s."**

***In this example, we use the 1979 U.S. age structure as the standard; thus the standardized U.S. death rate would remain 8.5. We could just as well use Mexico's age structure as the standard, or some third country's.***

**The Aging of America**

In 1800, the median age of the U.S. population was about 16 years. By 1983 it had risen to 31 years. This change occurred in response to the much lower birth rate by 1983 and to rising life expectancy as well. As members of the "baby boom" generation (those born in 1947-1964) get older and have fewer children themselves, we can expect the population to age still further. The baby boom cohort has, then, created something of an imbalance in the population since it will tend to outnumber succeeding cohorts. This could have serious implications, particularly for retirement systems in the coming years.




**U.S. Elderly Population, 1980 to 2050**

Source: U.S. Bureau of the Census projections

# Fertility

*Fertility refers to the actual reproductive performance of a population. It differs from fecundity, the physiological capability of couples to reproduce. Fertility, the number of live births occurring in a population, is affected by fecundity and also by the age at marriage or cohabitation, the availability and use of family planning, economic development, the status of women, and the age-sex structure.*

---

**Birth Rate**

The birth rate (also called crude birth rate) indicates the number of live births per 1,000 population in a given year.* Births are only one component of population change, and the birth rate should not be confused with the growth rate, which includes all components of change (see page 47).

$$\frac{\text{Number of births}}{\text{Total population}} \times K = \frac{3,914,000}{239,700,000} \times 1,000 = 16.5$$

**"There were 16 births per 1,000 population in the U.S. in 1983."**

***Around the world, crude birth rates vary widely. Kenya's 53 per 1,000 in 1983 is a very high birth rate, while Denmark's 10 per 1,000 is very low.***

*Most annual rates such as the birth rate relate demographic events to the population at midyear (the population as of July 1), which is considered to be the average population at risk during the year.

## General Fertility Rate

The general fertility rate (also called fertility rate) is the number of live births per 1,000 women aged 15-44 years* in a given year.

The general fertility rate is a somewhat more refined measure than the crude birth rate because it relates births more nearly to the age-sex group at risk of giving birth (i.e., women 15-44 years of age). This eliminates distortions that might arise because of different age and sex distributions in a total population. Thus, the general fertility rate is more indicative of changes in fertility behavior than is the crude birth rate.

$$\frac{\text{Number of births}}{\text{Number of women aged 15-44}} \times K = \frac{3,614,000}{55,260,000} \times 1,000 = 65.4$$

**"There were 65 births per 1,000 women aged 15-44 years in the U.S. in 1983."**

*Iran's general fertility rate in 1975 was 200 live births per 1,000 women aged 15-49—one of the highest in the world. A very low rate would be the Netherlands' 48 per 1,000 women 15-49, in 1980.*

## Age-Specific Fertility Rates

Fertility rates can also be obtained for specific age groups for comparison over time or to see differences in fertility behavior at different ages.

$$\frac{\text{Number of births to women aged 20-24}}{\text{Number of women aged 20-24}} \times K = \frac{1,205,979}{10,841,000} \times 1,000 = 111.3$$

**The age of childbearing for women is arbitrarily assumed for statistical purposes to be ages 15-44 in the U.S., even though some U.S. births actually occur to women under age 15 (nearly 10,000 in 1982) and some to women over 44 (about 1,200 in 1982). In other countries, the range is often set at ages 15-49.*

Compare the U.S. fertility rates for women in the different age groups below.

| Year | Live births per 1,000 women in the age group | | |
|---|---|---|---|
| | 20-24 | 25-29 | 30-34 |
| 1982 | 111.3 | 111.0 | 64.2 |
| 1965 | 196.8 | 162.5 | 95.0 |
| 1955 | 242.0 | 190.5 | 116.2 |

**"In the U.S. in 1982, there were 111 live births to women aged 20-24 years per 1,000 women in that age group."**

***In 1955 the fertility rate for women 20-24 was more than twice as high as it was in 1982. And, by 1982, the rates for women 20-24 and 25-29 had equalized, reflecting the trend towards delayed childbearing.***

**Completed Fertility Rate**

The number of "children ever born" at various ages of the mother provides one measure of a population's fertility. Populations with similar birth rates can have differing numbers of children ever born for women ages 20-24, for example, if their timing of births differs. When this measure is applied to women over 45, the measure is called the completed fertility rate.

The completed fertility rate is a cohort measure which answers the question: How many children did a certain cohort of women who have completed their childbearing years actually have during those years?

**"In 1910, the completed fertility rate for women aged 50-54 was 4.1 births per woman; in 1980, it was 3.0."**

***In many developing countries, completed fertility rates are above 7 births per woman.***

Often, though, we need to summarize what fertility is, as of "now" – without waiting for the end of the childbearing years. This is where the *total fertility rate* comes in.

**Total Fertility Rate**

The total fertility rate (TFR) is the average number of children that would be born alive to a woman (or a group of women) during her lifetime if she were to pass through all her childbearing years conforming to the age-specific fertility rates of a given year.

The TFR sums up in a single number the fertility of all women at a given point in time. In effect, it says: This is the total number of children a woman would have if she had the same chance of having a birth at age 15-19 as all women that age in a given year; at age 20-24 as all women that age in that same year; at age 25-29, . . . and so forth up to age 44 (see box on the next page showing how the TFR is calculated).

The TFR is a *synthetic* measure; no individual woman is very likely to pass through three decades conforming to the age-specific fertility rates of 1983 or any other single year. In reality, age-specific rates change and fluctuate from year to year, even if only gradually. For example, women who were 15-19 in 1983 may delay having children longer than women 15-19 in, say, 1973. By so doing, they would lower the TFR a bit in 1983 but then raise it several years later when they do begin their childbearing. Thus, year-to-year fluctuations in the TFR may reflect changes in the *timing* of births rather

**U.S. Total Fertility Rates from 1930 to 1983**

Source: U.S. Bureau of the Census

## Calculating the TFR

| Age of women | (1) Number of women | (2) Births to that age group | (3) Rate (2) ÷ (1) |
|---|---|---|---|
| 15-19 | 9,693,547 | 513,759 | .053 |
| 20-24 | 10,864,676 | 1,205,979 | .111 |
| 25-29 | 10,377,784 | 1,151,934 | .111 |
| 30-34 | 9,457,391 | 605,273 | .064 |
| 35-39 | 7,996,190 | 167,920 | .021 |
| 40-44 | 6,166,000 | 24,664 | .004 |
| | | Sum | .364 |
| | | Sum times 5 = | 1.82 |

The rates in column (3) simulate the likelihood of a woman giving birth during each year of her childbearing years, i.e., they approximate the "risk" of having a birth. Summing these rates results in the number of children she would have by age 44: the total fertility rate. Note that it is necessary to multiply the sum above by five since the data are shown by five-year age groups. Each woman is subject to the annual "risk" of a birth five times in each age group, i.e. .111 when she is 20, .111 when she is 21, etc. Although the TFR concept may seem complex at first, it is actually quite simple. (1982 data)

than changes in the average number of children women bear. Nonetheless, the TFR is one of the most useful indicators of fertility because it gives as good as possible an answer to the question: How many children are women having nowadays?

**"The total fertility rate in 1983 in the United States was 1.8 births per woman (or 1,800 births per 1,000 women). That is, if 1983 age-specific rates continued unchanged, U.S. women would average about 1.8 children each during their childbearing years."**

***In many developing countries, the TFR is often over 6.0 children per woman. In most developed countries, it is below 2.0.***

**Gross Reproduction Rate**

The gross reproduction rate (GRR) is the average number of daughters that would be born to a woman (or group of women) during her lifetime if she passed through her childbearing years conforming to the age-specific fertility rates of a given year. This rate is like the TFR except that it counts only daughters and literally measures "reproduction" – a woman reproducing herself by having a daughter.

**Net Reproduction Rate**

The net reproduction rate (NRR) is the average number of daughters that would be born to a woman (or group of women) if she passed through her lifetime from birth conforming to the age-specific fertility *and* mortality rates of a given year. This rate is similar to the GRR, but is always lower than the GRR because it takes into account the fact that some women will die before completing their childbearing years.

| Country | 1980 GRR | 1980 NRR |
|---|---|---|
| Sierra Leone | 3.02 | 1.59 |
| Mexico | 2.44 | 2.18 |
| U.S. | 0.90 | 0.88 |

**"In 1980, Sierra Leone had a GRR of 3.02, while that of the U.S. was only 0.90. That means that if 1980 fertility levels were to continue, a woman in Sierra Leone would produce 3 daughters on the average, during her lifetime. (Since Sierra Leone's NRR is 1.59, only 1.5 average of the daughters would survive through the childbearing years.) In the U.S., by contrast, a woman would produce less than 1 daughter on the average during her lifetime."**

***In a developed country like the U.S., the NRR has been some 98 percent of the GRR, because most females survive through their childbearing years. In Sierra Leone, however, the NRR is only 53 percent of the GRR, mainly because of the high infant and child mortality.***

**Replacement Level Fertility**

Replacement level fertility is the level of fertility at which a cohort of women, on the average, have only enough daughters to "replace" themselves in the population. An NRR of 1.00 is equal to replacement level.

Once replacement level fertility has been reached, births will gradually reach equilibrium with deaths, and in the absence of immigration and emigration, a population will ultimately stop growing, and become a stationary population.

Today, some two dozen developed countries are at or below replacement level fertility. The U.S., with an NRR of 0.88 in 1980, is currently below replacement level. *Nevertheless, the U.S. population is still growing.* A population which has achieved replacement or below-replacement fertility may still continue to grow for some decades, since past high fertility may have led to a high concentration of women in the childbearing ages and

Woman and children in Ethiopian relief camp, 1973

UNICEF/John Balcomb

hence total births continue to exceed total deaths. Thus it may take two or three generations (50 to 70 years) before each new birth is offset by a death in the population. Although replacement level fertility was reached in the U.S. around 1972, there are still about 1.5 million more births than deaths each year. The tendency of a population to continue to grow even after replacement level fertility has been achieved is known as population *momentum*.

The total fertility rate can also be used to indicate replacement level fertility by showing the average number of children sufficient to exactly replace both parents in the population. In the U.S. today, a TFR of about 2.1 is considered to be replacement level. Why are replacement level TFRs higher than exactly 2.00 (one child for each parent)? Because there are slightly more males than females born and because not all children will survive to the childbearing years. In developing countries with much higher mortality rates, TFRs higher than 2.1 are necessary to achieve replacement level.

**Illegitimacy Ratio**

The illegitimacy ratio is the number of illegitimate live births per 1,000 live births in a given year. This ratio should not be confused with the illegitimacy *rate*, which is described on the following page.

$$\frac{\text{Number of illegitimate births}}{\text{Total births}} \times K = \frac{715{,}227}{3{,}680{,}537} \times 1{,}000 = 194.3$$

**"There were 194 illegitimate births per 1,000 births in the U.S. in 1982."**

***Among blacks in the U.S., the 1970 illegitimacy ratio was 376 per 1,000; in 1982, it had risen to 567 per 1,000.***

**Illegitimacy Rate**

The illegitimacy rate is the number of illegitimate live births per 1,000 unmarried women (i.e., single, widowed, or divorced) aged 15-44 years in a given year. This rate should not be confused with the illegitimacy *ratio*, which is described on the preceding page.

$$\frac{\text{Number of illegitimate births}}{\text{Number of unmarried women aged 15-44}} \times K = \frac{718,227}{23,940,000} \times 1,000 = 30.0$$

**"There were 30 illegitimate births per 1,000 unmarried women aged 15-44 in the U.S. in 1982."**

*Illegitimacy rates vary widely. In 1966 Ireland's illegitimacy rate was 5.3 per 1,000 unmarried women, while Sweden's was 45.0 in 1975.*

**Child-Woman Ratio**

The child-woman ratio is the number of children under 5 years of age per 1,000 women of childbearing age in a given year. This measure is used as a rough fertility indicator, especially when detailed data on births are lacking.

$$\frac{\text{Number of children under 5}}{\text{Number of women aged 15-44}} \times K = \frac{17,826,000}{55,305,000} \times 1,000 = 322.3$$

**"There were 322 children under 5 years per 1,000 women of childbearing age in the U.S. in 1983."**

*In 1983, the child-woman ratio was 193 in West Germany. In Kenya, it was 1,003.*

**Abortion Ratio**

The abortion ratio is the estimated number of abortions per 1,000 live births in a given year. This ratio should not be confused with the abortion *rate*, which is described below.

$$\frac{\text{Number of abortions}}{\text{Number of live births}} \times K = \frac{1,298,000}{3,612,000} \times 1,000 = 359.4$$

**"In 1980 there were an estimated 359 abortions per 1,000 live births in the U.S."**

*In 1980 the abortion ratio in New York City was 952 abortions per 1,000 live births. In California, the abortion ratio was 506. In Wyoming it was only 76.*

**Abortion Rate**

The abortion rate is the estimated number of abortions per 1,000 women aged 15-44 years in a given year. This rate should not be confused with the abortion *ratio*, which is described above.

$$\frac{\text{Number of abortions}}{\text{Number of women aged 15-44}} \times K = \frac{1,298,000}{53,113,000} \times 1,000 = 24.4$$

**"In 1980 there were an estimated 24 abortions in the U.S. per 1,000 women in the childbearing years."**

*In 1981 the abortion rate in Hungary was 35, while the Canadian rate was 11. Within the U.S., 1980 abortion rates varied from 7 in West Virginia and Wyoming to 160 in the District of Columbia.*

# Mortality

*Mortality refers to deaths as a component of population change. Eventually death occurs to every population member, but the rate at which it occurs is linked to many factors, such as age, sex, race, occupation, and social class – and its incidence can reveal much about a population's standard of living and health care.*

## Death Rate

The death rate (also called crude death rate) is the number of deaths per 1,000 population in a given year.

$$\frac{\text{Number of deaths}}{\text{Total population}} \times K = \frac{2{,}010{,}000}{233{,}700{,}000} \times 1{,}000 = 8.6$$

**"In 1983 the U.S. death rate was 8.6 per 1,000 population."**

***In 1980, Guinea's death rate was about 25 per 1,000 population, while Taiwan's was only 5 per 1,000.***

Like crude birth rates, crude death rates are affected by many population characteristics, and particularly age structure. It is therefore prudent, when comparing death rates between countries, to adjust for differences due to age composition (see comparing populations, page 15) before making conclusions about a country's health, economic, or environmental conditions.

For example, Sweden's crude death rate is higher than Guatemala's – 11 per 1,000 population compared to 7 per 1,000 – despite the fact that life expectancy in Sweden is a hale 76 years, compared to only 59 for Guatemala. The higher Swedish rate is attributable to the differences in age composition between the two

countries. "Old" Sweden has 16 percent of its population in the 65-and-over group where deaths are more likely to occur, while "young" Guatemala's proportion of elderly persons is only 4 percent of the total population. Thus, Sweden has a higher proportion of deaths in the total population each year than Guatemala, even though it has better health conditions and lower age-specific death rates.

**Age-Specific Death Rate**

Death rates can be obtained for specific age groups for comparison of mortality at different ages or a change in mortality at the same age over time. Comparisons can also be made between countries or areas.

Since mortality varies greatly by sex and race, age-specific death rates are often given separately for males and females and for different racial groups in a population.

$$\frac{\text{Deaths of people aged 25-34}}{\text{Total population aged 25-34}} \times K = \frac{49,830}{40,168,250} \times 1,000 = 1.2$$

**"In the U.S. in 1983, the age-specific death rate for persons aged 25-34 years was 1.2 deaths per 1,000 population of that age."**

***By comparison, the 1983 age-specific death rate for persons aged 65-69 in the U.S. was 24 per 1,000 of that age.***

**Cause-Specific Death Rates**

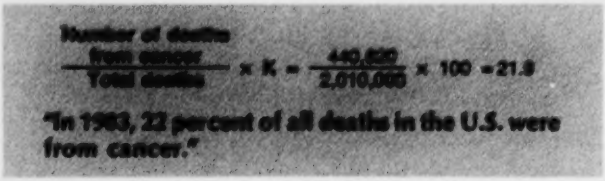
Basic cause-specific death rates are usually expressed in deaths per 100,000 because for most causes of deaths the rates of occurrence are so low.

$$\frac{\text{Number of deaths from cancer}}{\text{Total population}} \times K = \frac{440,820}{233,700,000} \times 100,000 = 188.5$$

**"In 1983, 189 persons per 100,000 population died of cancer in the U.S."**

**Proportion Dying of a Specific Cause**

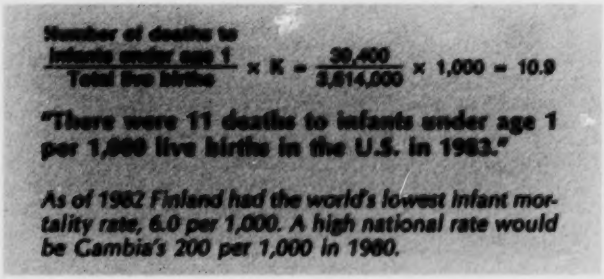
Deaths from a specific cause can be expressed as a percentage of all deaths.


Number of deaths from cancer / Total deaths × K = 440,820 / 2,010,000 × 100 = 21.9
"In 1983, 22 percent of all deaths in the U.S. were from cancer."

The causes of death vary greatly from population to population and from period to period, and are influenced by many factors, including health and environmental conditions. In 1900 in the U.S., the pneumonia-bronchitis-influenza class of diseases was the leading cause of death, accounting for 17.2 percent of all deaths, while heart disease was the cause of 7.1 percent. By 1983, however, heart disease was the leading cause of death, accounting for 38.1 percent of all deaths, while pneumonia-bronchitis-influenza caused only 2.9 percent.

**Infant Mortality Rate**

The infant mortality rate is the number of deaths to infants under 1 year of age per 1,000 live births in a given year.


Number of deaths to infants under age 1 / Total live births × K = 39,400 / 3,614,000 × 1,000 = 10.9
"There were 11 deaths to infants under age 1 per 1,000 live births in the U.S. in 1983."
As of 1982 Finland had the world's lowest infant mortality rate, 6.0 per 1,000. A high national rate would be Gambia's 200 per 1,000 in 1980.

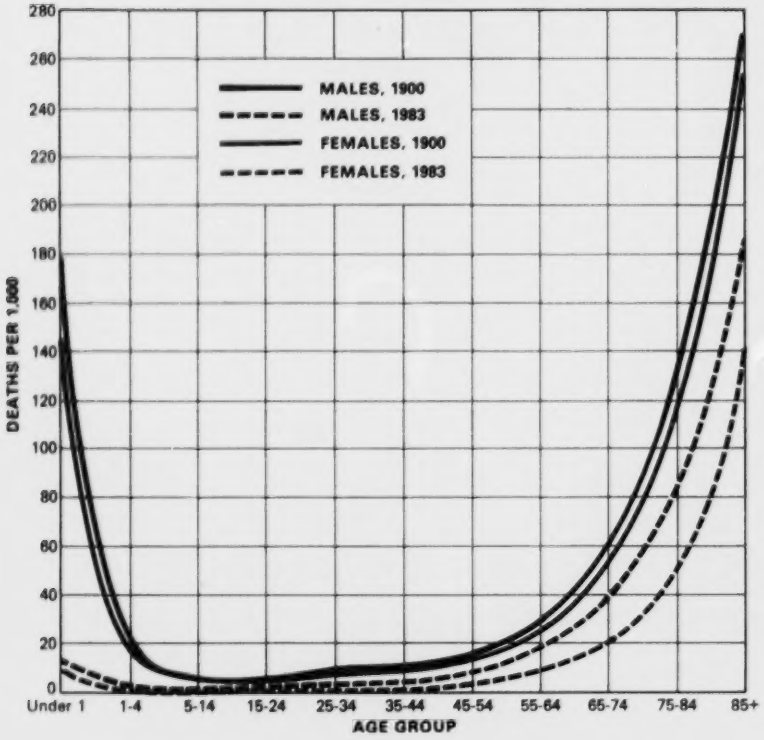
The infant mortality rate is considered a good indication of the health status of any given area. Presently, about a dozen nations have infant mortality rates below the U.S. level.

**Maternal Mortality Rate**

The maternal mortality rate is the number of women who die as a result of childbearing in a given year per 100,000 births in that year. Maternal deaths are those caused by complications of pregnancy and childbirth.

$$\frac{\text{Number of maternal deaths}}{\text{Total live births}} \times K = \frac{290}{3{,}614{,}000} \times 100{,}000 = 8.0$$

**"There were 8 maternal deaths per 100,000 live births in the U.S. in 1983."**




**U.S. Death Rates by Age and Sex, 1900 and 1983**

Source: National Center for Health Statistics

## Life Expectancy

Life expectancy is an estimate of the *average* number of additional years a person can expect to live, based on the age-specific death rates for a given year. Since this measure differs significantly depending on a person's sex, present age, and race, these categories are usually given separately. However, life expectancy at birth is the most commonly cited life expectancy measure.

Life expectancy is a hypothetical measure and indicator of current health conditions. It is not a rate. Changing mortality trends in the future will change each person's life expectancy as he or she grows older.

**"If the age-specific death rates for 1983 remain unchanged, U.S. white males born in 1983 can expect to live 71.6 years on the average. Similarly, white females can expect to live 78.8 years."**

***For U.S. black males born in 1983, life expectancy at birth was 65.2 years; for black females it was 73.8 years. Life expectancies can differ even more widely between countries. In Sierra Leone life expectancy at birth was 33 years around 1980, whereas in that same year Norway's life expectancy was 76 years, more than twice as high.***

It should be noted that low life expectancies in developing countries are in part due to a high infant mortality rate. In 1971, for example, life expectancy at birth in Liberia was 45 years, but if a Liberian survives to 1 year of age, he or she can expect to live an average of 52 years.

## The Life Table

The life table, one of the most powerful tools in demography, is used to simulate the lifetime mortality experience of any population. It does so by taking that population's age-specific death rates and applying them to a *hypothetical* population of 100,000 all born at the same time. Year by year on the life table, death inevita-

bly thins the hypothetical population's ranks until in the bottom row of statistics, even the oldest survivors pass away.

The box on the opposite page contains selected portions of two abridged life tables for two U.S. demographic groups with significantly different life expectancies: white females and black males. These tables are based on death rates, and are abridged to display their data at 5-year age intervals rather than broken down into single years.

Column 1, from which all the other columns can be generated, shows the proportion of each age group dying in each age interval. These data are based on the observed mortality experience of a known population. Column 2 shows the number of people available at the beginning of each age interval, starting with 100,000 at birth. Each interval contains the population that survived the preceding interval. Column 3 shows the number who died at each age (Col. 1 × Col. 2 = Col. 3).

Column 4 shows the total person-years of life to be shared by the population members at each age interval. This measure takes into account the frequency of deaths that will occur in that interval and all subsequent intervals. As age increases and the population shrinks, the total person-years that the survivors have to live necessarily diminish.

Life expectancy is shown in Column 5. The total number of person-years listed for each age interval, when divided by the number of persons living at the beginning of that interval, equals life expectancy – the average number of years remaining for a person in that age interval (Col. 4/Col. 2 = Col. 5). For example, dividing the 78,608 white females who survive to age 70 into their total person years (1,199,958) shows they have an additional life expectancy of 15.3 years.

With age, life expectancy actually rises – a kind of "bonus" for surviving. The 78,608 white females who survive to age 70, for example, can expect to live over 15 more years, well past their birth expectation of 78.8 years.

# Two Examples of How Life Tables Work

*U.S. Abridged Life Tables, 1982, for White Females and Black Males*

| Age | (1) Proportion dying in the age interval | (2) No. living at beginning of interval | (3) No. dying during interval | (4) Person years lived in this & all subsequent intervals | (5) Yrs. of life remaining |
|---|---|---|---|---|---|
| | | | **White Females** | | |
| under 1 | .00688 | 100,000 | 888 | 7,875,084 | 78.8 |
| 1-5 | .00187 | 99,112 | 185 | 7,775,853 | 78.5 |
| 5-10 | .00109 | 98,927 | 108 | 7,379,834 | 74.6 |
| 10-15 | .00103 | 98,819 | 102 | 6,885,491 | 69.7 |
| • | | | | | |
| • | | | | | |
| • | | | | | |
| 70-75 | .11794 | 78,608 | 9,271 | 1,199,958 | 15.3 |
| 75-80 | .18312 | 69,337 | 12,697 | 828,722 | 12.0 |
| 80-85 | .28988 | 56,640 | 16,419 | 512,466 | 9.0 |
| 85+ | 1.00000 | 40,221 | 40,221 | 270,046 | 6.7 |
| | | | **Black Males** | | |
| under 1 | .02159 | 100,000 | 2,159 | 6,494,155 | 64.9 |
| 1-5 | .00364 | 97,841 | 356 | 6,396,016 | 65.4 |
| 5-10 | .00230 | 97,485 | 224 | 6,005,495 | 61.6 |
| 10-15 | .00216 | 97,261 | 210 | 5,518,681 | 56.7 |
| • | | | | | |
| • | | | | | |
| • | | | | | |
| 70-75 | .25517 | 45,613 | 11,639 | 498,786 | 10.9 |
| 75-80 | .31230 | 33,974 | 10,610 | 300,013 | 8.8 |
| 80-85 | .41046 | 23,364 | 9,590 | 157,685 | 6.7 |
| 85+ | 1.00000 | 13,774 | 13,774 | 66,177 | 4.8 |

Source: National Center for Health Statistics.

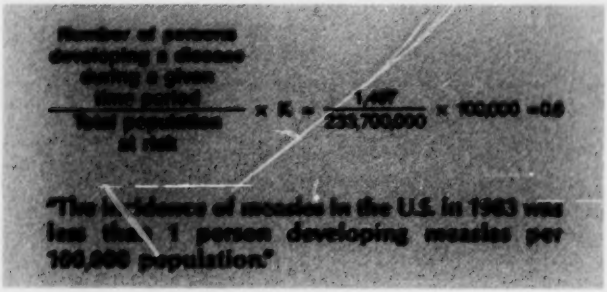
# Morbidity

*Morbidity refers to disease and illness in a population. The outbreak of a disease can have serious effects on other aspects of the population. Data about the frequency and distribution of a disease can aid in controlling its spread and in some cases lead to an identification of its cause.*

---

**Incidence Rate**

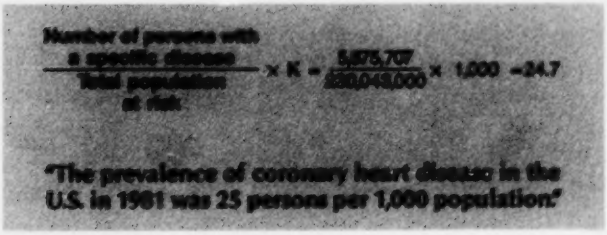
The incidence rate is the number of persons contracting a disease during a given time period per 1,000 population at risk.


Number of persons developing a disease during a given time period / total population at risk × K = 1,497 / 233,700,000 × 100,000 = 0.6
"The incidence of measles in the U.S. in 1983 was less than 1 person developing measles per 100,000 population."

The incidence rate and other morbidity rates vary so widely that any constant may be used that expresses the rate in a clear manner (from "per 100" and "percent" to "per 100,000").

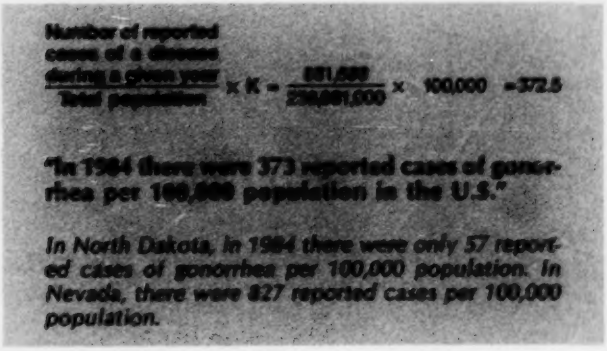
**Prevalence Rate**

The prevalence rate is the number of persons having a particular disease at a given point in time per 1,000 population at risk. This rate includes all previously existing cases as well as new cases developing during the specified period. The prevalence rate is a "snapshot" of an existing health situation; it describes the health status of a population.


Number of persons with a specific disease / Total population at risk × K = 5,875,707 / 230,043,000 × 1,000 = 24.7
"The prevalence of coronary heart disease in the U.S. in 1981 was 25 persons per 1,000 population."

**Case Rate**

The case rate is the number of reported cases of a specific disease or illness per 100,000 population during a given year. The case rate is a special type of incidence rate but differs in that it is based on the number of reported cases, which is not necessarily the number of persons contracting the disease (i.e., some people may get the disease more than once).


Number of reported cases of a disease during a given year / Total population × K = 881,000 / 236,681,000 × 100,000 = 372.5
"In 1984 there were 373 reported cases of gonorrhea per 100,000 population in the U.S."
In North Dakota, in 1984 there were only 57 reported cases of gonorrhea per 100,000 population. In Nevada, there were 827 reported cases per 100,000 population.

**Case Fatality Rate**

The case fatality rate is the proportion of persons contracting a disease who die of that disease.

$$\frac{\text{Number of persons dying from the disease}}{\text{Number of persons developing the disease}} \times K = \frac{1,228}{3,741} \times 100 = 81.8$$

"In 1983 the case fatality rate for Acquired Immune Deficiency Syndrome (AIDS) was 82 percent."

C. Audran after P. Mignard, Library of Congress

The Plague.

# Nuptiality

*Nuptiality refers to marriage as a population phenomenon, including the rate at which it occurs, the characteristics of persons united in marriage, and the dissolution of such unions (through divorce, separation, widowhood, and annulment).*

**Marriage Rate**

The marriage rate (also called crude marriage rate) is the number of marriages per 1,000 total population in a given year. This rate is calculated using the number of marriages – *not* the number of people getting married – and includes both first marriages and remarriages.

$$\frac{\text{Number of marriages}}{\text{Total population}} \times K = \frac{2,444,000}{230,700,000} \times 1,000 = 10.5$$

"In 1983 the crude marriage rate for the U.S. was 10.5 per 1,000 population."

**Median Age at First Marriage**

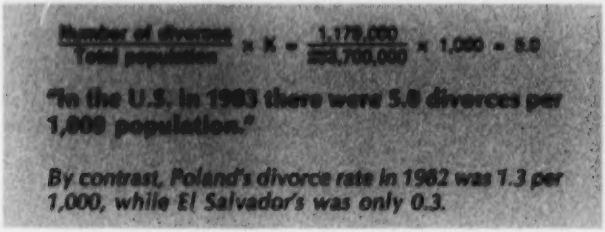
Half the people marrying for the first time in a given year got married before the median age, half after. The median age at first marriage is usually computed separately for males and females, since females typically marry at younger ages. The median age at first marriage has an effect on a population's fertility.

"In 1981 the median age at first marriage in the U.S. was 23.9 years for males and 22.0 years for females."

*Median age at first marriage varies widely. In Pakistan in 1975, it was about 16 for females and, in Sweden, 25.*

**Divorce Rate**

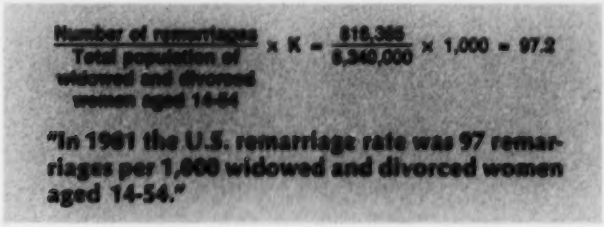
The divorce rate (or crude divorce rate) indicates the number of divorces per 1,000 population in a given year. This rate is calculated using the number of divorces – *not* the number of people being divorced.


Number of divorces / Total population × K = 1,179,000 / 232,700,000 × 1,000 = 5.0
"In the U.S. in 1983 there were 5.0 divorces per 1,000 population."
By contrast, Poland's divorce rate in 1982 was 1.3 per 1,000, while El Salvador's was only 0.3.

The U.S. crude divorce rate of 5.0 per 1,000 in 1983 was double the 2.5 rate of 1965 and now ranks among the world's highest. If current U.S. divorce rates continue, almost 50 percent of all marriages will end in divorce.

**Remarriage Rate**

The remarriage rate is the number of remarriages (i.e., second or higher order marriages) per 1,000 population of currently divorced and widowed men or women aged 14-54 years.


Number of remarriages / Total population of widowed and divorced women aged 14-54 × K = 816,365 / 8,340,000 × 1,000 = 97.2
"In 1981 the U.S. remarriage rate was 97 remarriages per 1,000 widowed and divorced women aged 14-54."

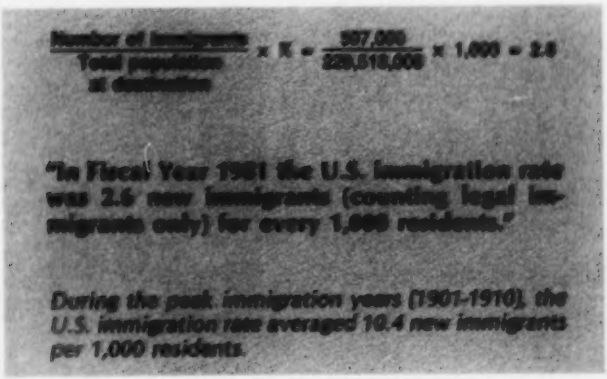
# Migration

*Migration is the movement of population; more exactly, the movement of people across a specified boundary for the purpose of residing. Along with fertility and mortality, migration is a component of population change. The terms immigration and emigration are used to refer to moves between countries (international migration). The parallel terms in-migration and out-migration are used for internal movement between different areas within a country (internal migration).*

---

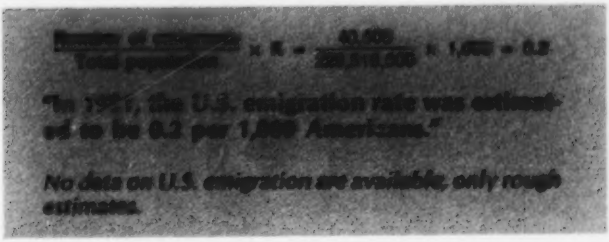
**Immigration Rate**

The immigration rate is the number of immigrants arriving at a destination per 1,000 population at that destination in a given year.


Number of immigrants / Total population at destination × K = 597,000 / 229,510,000 × 1,000 = 2.6
"In Fiscal Year 1981 the U.S. immigration rate was 2.6 new immigrants (counting legal immigrants only) for every 1,000 residents."
During the peak immigration years (1901-1910), the U.S. immigration rate averaged 10.4 new immigrants per 1,000 residents.

**Emigration Rate**

The emigration rate is the number of emigrants departing an area of origin per 1,000 population at that area of origin in a given year.



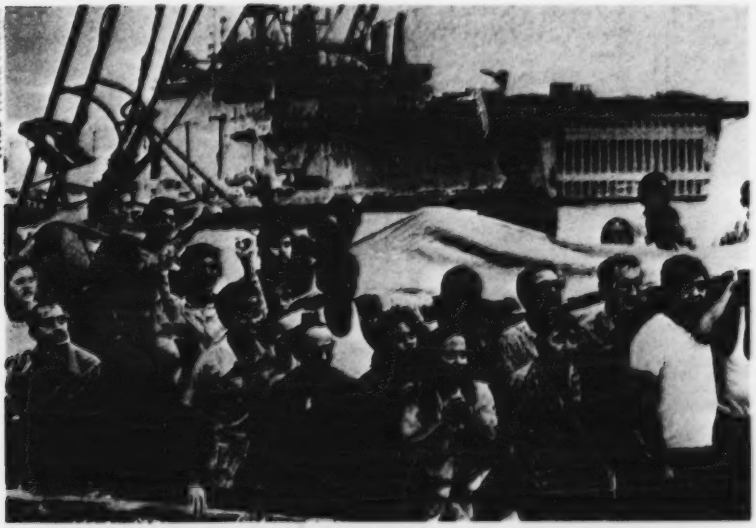
"In 1971, the U.S. emigration rate was estimated to be 0.2 per 1,000 Americans."

*No data on U.S. emigration are available, only rough estimates.*

**Net Migration**

The net effect of immigration and emigration on an area's population (increase or decrease) is referred to as net migration.

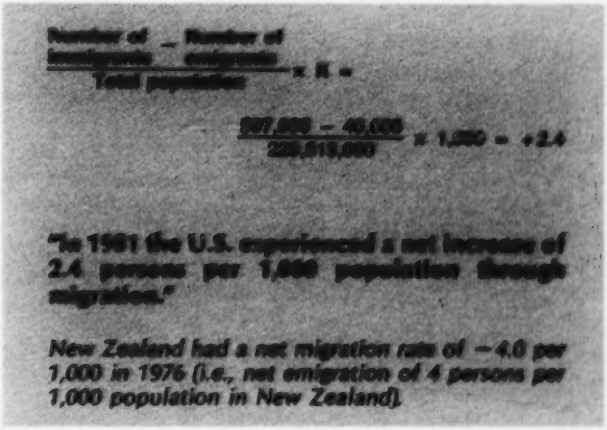
Wide World Photos



Cuban refugees at Key West, 1980.

**Net Migration Rate**

The net migration rate shows the net effect of immigration and emigration on an area's population, expressed as increase or decrease per 1,000 population of the area in a given year.


Number of immigrants − Number of emigrants / Total population × K =
207,000 − 40,000 / 229,513,000 × 1,000 = +2.4
"In 1981 the U.S. experienced a net increase of 2.4 persons per 1,000 population through migration."
New Zealand had a net migration rate of −4.0 per 1,000 in 1976 (i.e., net emigration of 4 persons per 1,000 population in New Zealand).

**Illegal Immigration**

In estimating migration rates for population estimates and projections, the U.S. Census Bureau has only been able to use the reported number of *legal* immigrants. Undocumented immigration to the U.S. has become a subject of increasing concern, both in the Southwest and in several large metropolitan areas.

Although there are no statistics on the number of illegal aliens present at any given time, the Census Bureau was able to estimate how many were counted during the 1980 Census. By comparing country of birth data collected in the Census to official immigration statistics, it was estimated that 2 million illegal aliens answered the 1980 Census. About 45 percent of those were from Mexico, 23 percent from other Latin American countries, and the remaining 31 percent from the balance of the world. The extent to which illegal aliens are a burden or a benefit to the U.S. is a matter of spirited public debate.

# Urbanization and Distribution

*Urbanization is the increase in the proportion of the population living in urban areas – the process of people moving to cities or other densely settled areas. Population distribution refers to the patterns of settlement and dispersal of population within a country or other area.*

---

**"Urban"** Countries differ in their definition of "urban," although it is fairly common for the urban population to consist of those living in towns and cities of 2,000 or more, especially if the population is largely nonagricultural. In densely populated Japan, it is the population in cities of 50,000 or more. In the United States, those living in places of 2,500 or more are considered urban.

**Metropolitan Area** A metropolitan area is defined as a large concentration of population, usually an area of 100,000 or more with an important city at its core plus those suburban and "exurban" areas which surround the city and are socially and economically intergrated with it.

**MSAs** The U.S. Office of Management and Budget (OMB) designates Metropolitan Statistical Areas (MSAs) in order to provide a consistent urban definition for government agencies. Researchers use them as well and business often refers to MSAs as "market areas." MSAs are composed of counties, at least one of which has a city of 50,000 or more population. A MSA may be a single county or may contain a number of adjacent counties which are economically and socially integrated (as by commuting patterns).

Prior to 1983, all metro areas were known as Standard Metropolitan Statistical Areas (SMSAs). The shift

in 1983 to MSAs was designed to account for the large geographic growth of many SMSAs since they were first defined in 1950. Smaller SMSAs were designated MSAs, while the larger ones were called Consolidated MSAs (CMSAs). The CMSAs, in turn, have other cities within their borders which could be metropolitan areas in their own right. These "subsets" of the CMSAs are called Primary MSAs (PMSAs). (See map, page 45). Thus, the Detroit CMSA has one PMSA within it, Ann Arbor, composed of Washtenaw County.

While the new criteria are complex, they result from a need to better reflect the increasingly complex nature of the U.S. urban structure itself.

**"In 1980 the Detroit metro area had a population of 4,353,413; 1,203,339 in Detroit itself, and 3,150,074 outside the central city."**

**Percent Urban**

The population living in urban areas can be expressed as a percentage of the total population. The remainder is considered "rural."

$$\frac{\text{Number living in urban areas}}{\text{Total population}} \times K = \frac{167,050,992}{226,545,805} \times 100 = 73.7$$

**"In 1980 the population of the U.S. was 74 percent urban."**

**Urbanized Area**

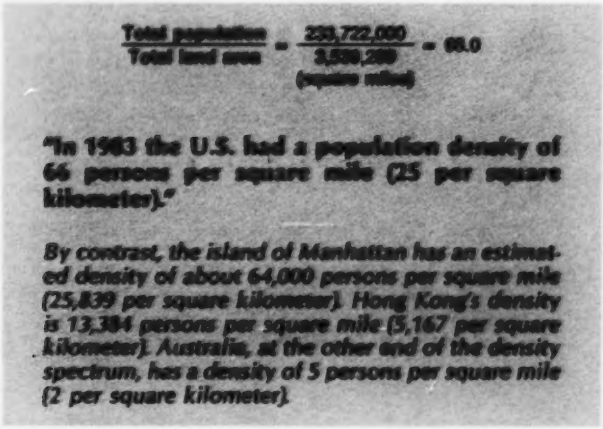
Yet another way of classifying territory as "urban" is the Urbanized Area (UA). There were 366 such areas defined in the 1980 Census. These conform closely to what many may think of as the true metropolitan area of a large city. Basically, a UA consists of a central city or cities and the surrounding closely settled territory or "urban fringe."

The area of a UA "looks" urban, rather like a city expanse as viewed from an airplane. Thus the definition of many UAs would probably not include open rural land that might still be part of an MSA's outlying territory.

**Population Density**

Population density is usually expressed as the number of people per unit of land area.

Density figures are often more meaningful if given as population per unit of arable land; for example, in 1984 Egypt had an estimated 122 persons per square mile (49 per square kilometer) of its total land area, but about 4,256 persons per square mile (1,643 per square kilometer) of *arable* land. Other useful "density" measures are the average number of persons per household or per room – measures that are sometimes used to show crowding.


Total population / Total land area = 233,722,000 / 3,539,289 (square miles) = 66.0
"In 1983 the U.S. had a population density of 66 persons per square mile (25 per square kilometer)."
By contrast, the island of Manhattan has an estimated density of about 64,000 persons per square mile (25,839 per square kilometer). Hong Kong's density is 13,384 persons per square mile (5,167 per square kilometer). Australia, at the other end of the density spectrum, has a density of 5 persons per square mile (2 per square kilometer).

**Population Shifts in the U.S.**

Shifting population distribution in the U.S. has received much attention in the media, and with good reason. States of the South and Southwest, the well-known "Sunbelt" have been gaining population rapidly, very rapidly in some instances, while those of the Midwest and Northeast remain stable or even lose. Much of this is the result of migration, but some faster Sunbelt growth is due to higher birth rates. Part of the Sunbelt's attraction has been economic – jobs, lower energy and labor costs, lower taxes in some instances – and part may be a perception of a better quality of life away from northern cities.

California has been growing at a phenomenal half million per year, leading in terms of numbers gained, but Texas, Florida, Nevada, Arizona and other Sunbelt states also show large population increases. How long can this situation last? Surely not everyone plans a move to the Sunbelt. As of 1984, there are some signs of a slowdown. With the resurgence of the domestic automobile industry, several Midwest states such as Ohio and Michigan have ceased losing population. Yet many of the factors pulling migrants south do remain, particularly retirement migration. This factor will probably be a nearly permanent feature of America's "life cycles" and will play a major role in a faster aging of the Sunbelt states – the "graying of the Sunbelt," a major issue for the future.

**Detroit Metropolitan Area**

Source: Office of Management and Budget

# Population Change

*Population change has three components: births, deaths, and migration. As people are born, die, or move, their total numbers in an area will change. During most of history, world population has increased very slowly, but during the 20th century this growth has accelerated.*

## The Balancing Equation

The most basic method of calculating numerical population change over time is the "balancing equation."

$$P_2 = P_1 + (B - D) + (I - E)$$

*Where $P_2$ is the population at the later date, $P_1$ is the population at the earlier date, B is births and D is deaths between the two dates, and I is immigration (or in-migration) and E is emigration (or out-migration) between the two dates.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 235,110,000 | = | 232,987,000 | + | (3,614,000 | − | 2,010,000) | |
| U.S. population Jan. 1984 | | U.S. population Jan. 1983 | | Births 1983 | | Deaths 1983 | |
| + | | (559,000 | − | 40,000) | | | |
| | | (legal) immigration 1983 | | emigration 1983 | | | |

**"During 1983, the U.S. population increased by 2.1 million."**

*This estimate does not take into account any illegal immigration into the country.*

## Natural Increase

Natural increase is the surplus (or deficit) of births over deaths in a population in a given time period.

$$NI = B - D$$

*Where* **NI** *is the natural increase during a period, and* **B** *is births and* **D** *is deaths during that period.*

## Rate of Natural Increase

The rate of natural increase is the rate at which a population is increasing (or decreasing) in a given year due to a surplus (or deficit) of births over deaths, expressed as a percentage of the base population. This rate does not include the effects of immigration or emigration.

$$\frac{\text{Births 1983} - \text{Deaths 1983}}{\text{Total population mid 1983}} \times K =$$

$$\frac{3{,}614{,}000 - 2{,}010{,}000}{233{,}981{,}000} \times 100 = 0.7$$

The rate of natural increase can also be calculated from birth and death rates:

$$\frac{\text{Birth rate} - \text{Death rate}}{10} = \frac{16 - 9}{10} = 0.7$$

**"In 1983, the U.S. rate of natural increase was 0.7 percent."**

## Growth Rate

The growth rate is the rate at which a population is increasing (or decreasing) in a given year due to natural increase *and* net migration, expressed as a percentage of the base population.

The growth rate takes into account all components of population growth: births, deaths, and migration. It should never be confused with birth rate (see page 17), but sometimes is.

$$\frac{\text{Births 1983} - \text{Deaths 1983} + \text{Net migration 1983}}{\text{Total population mid 1983}} \times K =$$

$$\frac{3,614,000 - 2,910,000 + 519,000}{238,961,000} \times 100 = 0.9$$

The growth rate can also be calculated from natural increase and net migration rates:

$$\text{Rate of natural increase} + \text{Net migration rate} = 0.7 + 0.2 = 0.9$$

**"In 1983, the U.S. annual growth rate was 0.9 percent."**

Birth rates and population growth characteristically fluctuate. A growth rate that is declining does *not* necessarily mean that an area's population is declining. It may only mean that the population is *growing at a slower rate*. A negative growth rate means that an area is losing population. Today, only a few countries are experiencing a decline in total population, but numerous other countries are experiencing a decline in their rates of population growth.

**"In 1984, the world's population was growing at an annual rate of 1.7 percent. (To put it another way, it was increasing by 17 per 1,000 population per year.) This growth rate means that in 1984 the world was increasing by over 82 million people a year."**

*The United Arab Emirates, with a growth rate of 13 percent in the late 1970s, had the world's highest growth rate, due to both a high rate of natural increase and a high net immigration rate. The Federal Republic of Germany, on the other hand, has been shrinking at an annual negative growth rate of −0.2 percent.*

**Doubling Time**

Growth expressed as a percentage is not always very informative. (Is a 3 percent growth rate fast or slow?) Sometimes a more vivid way of showing population growth is to calculate how long, at its current growth rate, a population would take to double in size. A country with a constant growth rate of 1 percent would double its population in 70 years; 2 percent, in 35 years; 3 percent, in 23 years.

A short way to estimate doubling time is to divide 70 by the growth rate expressed as a percent.

$$\frac{70}{\text{Growth rate (\%)}} = \frac{70}{0.9} = 77.8$$

**"If its 1983 growth rate of 0.9 percent were to continue, the U.S. would double its population in about 78 years."**

*With an annual growth rate of 1.3 percent in the late 1970s, the United Arab Emirates would require only about 5 years to double its population. Guatemala would take 20 years at 3.5 percent. Belgium, at its present low annual growth rate of 0.1 percent, would take several centuries to double its population.*

Doubling time is at best a crude way of estimating future population size, because it assumes a constant growth rate over decades, whereas growth rates are always changing. Nonetheless calculating doubling time helps to give a picture of just how fast a population is growing at the present time.

The world's population took 130 years to double from 1 billion to 2 billion. It then took only 46 years to double from 2 billion to 4 billion, and at present rates will double again in another 41 years.

## The Demographic Transition Theory

The most widely accepted theory explaining population change over time is the demographic transition theory. It states that both a population's fertility and mortality will decline from high to low levels as a result of economic and social development. The decline in mortality usually precedes the decline in fertility, resulting in high population growth during the transition period.

Finland is a good example of a country that has passed through the four stages of the demographic transition.

---

**Stage I.** High birth rate, high death rate = little or no increase. *(Finland in 1785-1790)*
birth rate 38 per 1,000
death rate 32 per 1,000
rate of
natural increase 0.6 percent

**Stage II.** High birth rate, falling death rate = high growth rate *(Finland in 1825-1830)*
birth rate 38 per 1,000
death rate 24 per 1,000
rate of
natural increase 1.4 percent

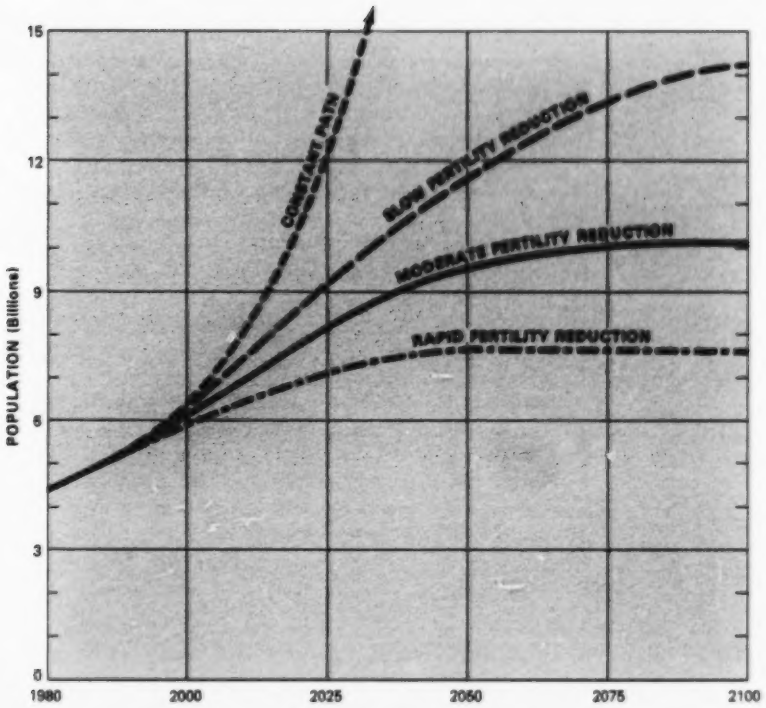
**Stage III.** Declining birth rate, relatively low death rate = slowed growth *(Finland in 1910-1915)*
birth rate 29 per 1,000
death rate 17 per 1,000
rate of
natural increase 1.2 percent

**Stage IV.** Low death rate, low birth rate = very low population growth *(Finland in 1970-1976)*
birth rate 13 per 1,000
death rate 10 per 1,000
rate of
natural increase 0.3 percent

---

## Beyond the Transition

There is, in fact, a fifth stage to the demographic transition which has recently attracted more and more attention. When fertility falls to very low levels, a slow rate of population growth can soon turn into a negative one. Many countries of Europe now have total fertility rates well below the replacement level of about 2 children per woman. As of 1983, West Germany's TFR of 1.3 was the world's lowest, but others were not far behind.




## World Population: Four Alternative Futures

The above chart shows four possible paths of future world population growth.

*The constant path* assumes that the 1980 growth rate will continue unchanged into the future.

*The slow fertility-reduction path* assumes that the world's fertility will decline to reach replacement level by 2065 (i.e., a total fertility rate of approximately 2.1). Under this assumption the world's population would stabilize at about 14 billion by the 22nd century.

*The moderate fertility-reduction path* assumes that replacement-level fertility will be reached by 2035 and the world's population would stabilize at about 10 billion sometime in the 21st century.

*The rapid fertility-reduction path* assumes that the world's fertility will decline to replacement level by 2010. Under this assumption, the world's population could stabilize at about 7.5 billion sometime during the 21st century.

World fertility (currently at an estimated total fertility rate of 3.8 children per woman) is unlikely to decline to replacement level (a TFR of approximately 2.1 children per woman) in just two decades, but could possibly reach that point by sometime in the early 21st century. Thus, the world's actual growth curve may fall somewhere between the rapid and slow fertility-reduction curves shown above. Exactly where the curve appears, and what level the world's population finally peaks at, will depend on the persistence and success of efforts toward development and family planning in the developing world.

Source: Population Reference Bureau

The concept of zero population growth (ZPG) is only valid when a country reaches replacement level fertility and maintains it rather closely. There is, however, no particular reason for a country with low fertility to settle in the ZPG groove. On the contrary, the limited experience so far is that declining fertility tends to drop below replacement, and (at least so far) stay there. This fact has become an issue in a number of developed countries and is likely to become an issue in quite a few others. The population of West Germany could easily be cut in half by the middle of the next century at its present birth rate, and the rate shows no sign of rising.

Population policies to raise the growth rate have been in effect in countries such as France and Czechoslovakia but seem to be relatively unsuccessful. Many of the factors which lowered fertility in the first place – greater involvement of women in the workplace, a rising cost of living, and changing tastes – appear to be keeping low rates low. In some countries with very low fertility, such population issues as illegal immigration and guest worker programs have become a focus of public debate.

**Population and the Future**

During most of human history, human numbers increased very slowly. It took hundreds of thousands of years for the world to reach 1 billion in total population (which happened about 1800). At that point, growth began to accelerate as death rates fell; only about 130 years were required to reach the second billion (about 1930); the 3 billion mark was passed in 1960 and the fourth billion took only 14 years, arriving in 1974. The fifth billion is likely to be added by 1987.

In 1985 the world birth rate was 27 births per 1,000 population with women averaging about 3.8 children each. The death rate was 11 per 1,000 population; this results in a rate of growth of 1.7 percent annually. This is down from the peak of about 2.1 percent in the late 1960s but is still high enough to result in a rapid rate of growth by any historical comparison. If this rate remained constant, the world would pass the fantastic level of 1 trillion by 2300. No one, of course, expects this to actually happen. Long before that point is ever reached, the growth curve will level off – a result of the birth rate going down, the death rate going up, or some combination of the two (see graph on preceding page).

The characteristics of population growth during the 20th century are indeed unique in world history – the world entered this century with less than 2 billion people and is projected to leave it with a little over 6 billion.

By then, it is projected that some 80 percent of the world's people will be living in the less developed countries (LDCs). The more developed countries will then constitute about one-fifth of humanity, and most of them are projected to have stopped growing at all (the United States is projected to still be growing, but at half today's rates).

What are the effects of such growth on economic development? Some argue that population growth and density are intrinsically beneficial to modernization and increased productivity. Others believe that the rapid rise in the population of most Third World nations is at the root of their development problems.

In August 1974 the World Population Conference was held in Bucharest, Romania, sponsored by the United Nations. There, representatives from 136 nations met and for the first time recognized the scope and complexity of the world's population problems. They approved a World Population Plan of Action, which stated that all couples and individuals have the basic right to decide freely and responsibly the number and spacing of their children and to have the information, education, and means to do so. In August 1984, the International Conference on Population, held in Mexico City with 149 nations participating, assessed and reaffirmed the 1974 Plan of Action.

During the decade between the two Conferences, many LDCs, besides making efforts to improve their economies and provide for the health of their citizens, increased their support for family planning programs. As a result of these three activities, total fertility rates (TFR) have come down significantly in the LDCs excluding China,* from about 6 lifetime children per woman in the late 1960s to about 4.8 in the mid-1980s.

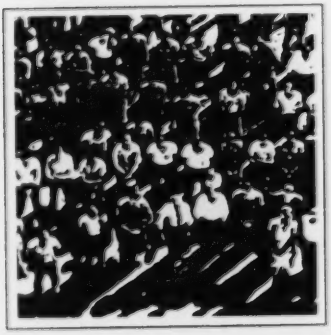
*Giving LDC fertility statistics "excluding China" can sometimes help provide a more representative picture of the population situation in LDCs as a whole. In recent years, China's recent fertility experience (a very low estimated TFR of 2.1 as of 1985), and family planning programs have been quite different from those in other LDCs.

Meanwhile, LDC birth rates excluding China have also fallen by about 10 percent – from about 41 births per 1,000 population in 1970-1975 to about 36 per 1,000 in 1980-1985. However, because death rates have also dropped slightly during the same period, the rate of natural increase for LDCs excluding China has not appreciably diminished during the past decade, and instead has remained around 2.4 percent annually.

In short: in the LDCs over the past 15 or 20 years, the TFR has probably fallen a significant amount, the birth rate has come down a little, and the growth rate has barely wavered. The slowness of the growth rate to respond to fertility changes is a prime example of population momentum.

What will happen during the rest of this century? Will economic and social development progress more rapidly than population growth? Will the world find out it can support much larger numbers than it does at present? Population has always been part of the study of history. In the latter part of the 20th century, the study of history will be in many ways the study of population.

# Appendix



# Glossary

**ABORTION RATE.** The estimated number of abortions per 1,000 women aged 15-44 years in a given year.

**ABORTION RATIO.** The estimated number of abortions per 1,000 live births in a given year.

**AGE-DEPENDENCY RATIO.** The ratio of persons in the ages defined as dependent (under 15 and over 64 years) to those in the ages defined as economically productive (15-64 years) in a population.

**AGE-SEX STRUCTURE.** The composition of a population as determined by the number or proportion of males and females in each age category. The age-sex structure of a population is the cumulative result of past trends in fertility, mortality, and migration. Information on age-sex composition is an essential prerequisite for the description and analysis of many other types of demographic data. See also *population pyramid*.

**AGE-SPECIFIC RATE.** Rate obtained for specific age groups (for example, age-specific fertility rate, death rate, marriage rate, illiteracy rate, school enrollment rate, etc.).

**AGING OF POPULATION.** A gradual process in which the proportions of adults and elderly increase in a population, while the proportions of children and adolescents decrease. This results in a rise in the median age of the population. Aging occurs when fertility rates decline while life expectancy remains constant or improves at the older ages.

**ANTINATALIST POLICY.** The policy of a government, society, or social group to slow population growth by attempting to limit the number of births.

**"BABY BOOM."** The period following World War II from 1947-1961 marked by a dramatic increase in fertility rates and in the absolute number of births in the U.S, Canada, Australia, and New Zealand.

**"BABY BUST."** The period immediately after the baby boom marked by a rapid decline in U.S. fertility rates to record low levels.

**BALANCING EQUATION.** A basic demographic formula used to estimate total population change between two points in time – or to estimate any unknown component of population change providing the other components are known. The balancing equation includes all components of population change: births, deaths, immigration, and emigration.

**BIRTH CONTROL.** Practices employed by couples that permit sexual intercourse with reduced likelihood of conception. The term birth control is often used synonymously with such terms as contraception, fertility control, and family planning.

**BIRTH RATE** (or crude birth rate). The number of births per 1,000 population in a given year. Not to be confused with *growth rate*.

**BRAIN DRAIN.** The emigration of a significant proportion of a country's highly skilled, highly educated professional population, usually to other countries offering better economic and social opportunity (for example, physicians leaving a developing country to practice medicine in a developed country).

**CARRYING CAPACITY.** The maximum sustainable size of a resident population in a given ecosystem.

**CASE FATALITY RATE.** The proportion of persons contracting a disease who die of that disease.

**CASE RATE.** The number of reported cases of a specific disease per 100,000 population in a given year.

**CAUSE-SPECIFIC DEATH RATE.** A mortality rate indicating the number of deaths attributable to a specific cause per 100,000 population in a given year.

**CENSUS.** A canvass of a given area, resulting in an enumeration of the entire population, and the compilation of demographic, social, and economic information pertaining to that population at a specific time. See also *survey*.

**CHILDBEARING YEARS.** The reproductive age span of women, arbitrarily assumed for statistical purposes to be 15-44 years in the U.S. In other countries, the range is often set at 15-49 years.

**CHILD-WOMAN RATIO.** The number of children under 5 years old per 1,000 women aged 15-44 years in a population. This crude fertility measure, based on basic census data, is sometimes used when more specific fertility information is not available.

**CLOSED POPULATION.** A population with no migratory flow in or out, so that changes in population size occur only through births and deaths.

**COHORT.** A group of people sharing a common temporal demographic experience who are observed through time. For example, the birth cohort of 1900 would be the people born in that year. There are also marriage cohorts, school class cohorts, etc.

**COHORT ANALYSIS.** Observation of a cohort's demographic behavior through life or through many periods; for example, examining the fertility behavior of the cohort of people born between 1900-1909 through their entire childbearing years.

Rates derived from such a cohort analysis are cohort measures. Compare *period analysis*.

**COMPLETED FERTILITY RATE.** The number of children born per woman to a cohort of women by the end of their childbearing years.

**CONSENSUAL UNION.** Cohabitation by an unmarried couple for an extended period of time. Consensual unions may be quite stable, but in official statistics people living in such unions are considered to be unmarried and their children technically illegitimate.

**CRUDE RATE.** Rate of any demographic event computed for an entire population.

**DEATH RATE** (or crude death rate). The number of deaths per 1,000 population in a given year.

**DEMOGRAPHIC TRANSITION.** The historical shift of birth and death rates from high to low levels in a population. The decline of mortality usually precedes the decline in fertility, thus resulting in rapid population growth during the transition period.

**DEMOGRAPHY.** (Greek, *demos* [people] + *graphie* [study]). The scientific study of human populations, including their size, composition, distribution, density, growth, and other demographic and socioeconomic characteristics, and the causes and consequences of changes in these factors.

**DEPENDENCY RATIO.** The ratio of the economically dependent part of the population to the productive part; arbitrarily defined as the ratio of the elderly (those 65 years and over) plus the young (those under 15 years of age) to the population in the "working ages" (those 15-64 years of age).

**DEPOPULATION.** The state of population decline.

**DIVORCE RATE** (or crude divorce rate). The number of divorces per 1,000 population in a given year.

**DOUBLING TIME.** The number of years required for a population of an area to double its present size, given the current rate of population growth.

**EMIGRATION.** The process of leaving one country to take up residence in another.

**EMIGRATION RATE.** The number of emigrants departing an area of origin per 1,000 population at that area of origin in a given year.

**EXPONENTIAL GROWTH.** A constant rate of growth *continuously* applied to a growing base over a period of time, for example, a savings account increasing at compound interest compounding daily; a snowball gathering mass; a population growing at 3.0 percent annually.

**EXPONENTIAL GROWTH RATE.** A growth rate applied to a quantity (such as a population or a savings account) continuously. It is analagous to interest compounded daily rather than some other period such as quarterly or annually. The term "exponential" is sometimes used to indicate "fast," but exponential rates can be quite low and even negative. The exponential form of the growth rate is appropriate for populations since they grow (or decline) continuously in response to births, deaths, and migration. The exponential rate does result in faster growth than the *geometric rate,* which see.

**FAMILY PLANNING.** The conscious effort of couples to regulate the number and spacing of births. Family planning usually connotes the use of birth control to avoid pregnancy, but also includes efforts of couples to induce pregnancy.

**FECUNDITY.** The physiological capacity of a woman, man, or couple to produce a live child.

**FERTILITY.** The actual reproductive performance of an individual, a couple, a group, or a population.

**FERTILITY RATE.** See *general fertility rate.*

**GENERAL FERTILITY RATE.** (also referred to as fertility rate). The number of live births per 1,000 women aged 15-44 years in a given year.

**GEOMETRIC GROWTH RATE.** A rate of growth compounded at the end of certain fixed intervals such as months, quarters, or a year. This rate produces somewhat slower growth than the *exponential rate* (see) since growth is not continuous. The exponential rate is, in a sense, a special case of the geometric.

**GROSS REPRODUCTION RATE (GRR).** The average number of daughters that would be born alive to a woman (or group of women) during her lifetime if she passed through her childbearing years conforming to the age-specific fertility rates of a given year. See *net reproduction rate* and *total fertility rate.*

**GROWTH RATE.** The rate at which a population is increasing (or decreasing) in a given year due to natural increase and net migration, expressed as a percentage of the base population.

**ILLEGAL ALIEN** (sometimes called undocumented alien). A foreigner who has entered a country without inspection or without proper documents, or who has violated the terms of legal admission to the country, for example, by overstaying the duration of a tourist or student visa.

**ILLEGITIMACY RATE.** The number of illegitimate live births per 1,000 unmarried women (single, widowed, or divorced) aged 15-44 years in a given year.

**ILLEGITIMACY RATIO.** The number of illegitimate live births per 1,000 live births in a given year.

**IMMIGRATION.** The process of entering one country from another to take up permanent residence.

**IMMIGRATION RATE.** The number of immigrants arriving at a destination per 1,000 population at that destination in a given year.

**INCIDENCE RATE.** The number of persons contracting a disease as a proportion of the population at risk, per unit of time.

**INFANT MORTALITY RATE.** The number of deaths to infants under one year of age in a given year per 1,000 live births in that year.

**IN-MIGRATION.** The process of entering one administrative subdivision of a country (e.g., county or state) from another subdivision to take up residence.

**LIFE EXPECTANCY.** The average number of additional years a person would live if current mortality trends were to continue. Most commonly cited as life expectancy at birth.

**LIFE SPAN.** The maximum age that human beings could reach under optimum conditions.

**LIFE TABLE.** A tabular display of life expectancy and the probability of dying at each age for a given population, according to the age-specific death rates prevailing at that time. The life table gives an organized, complete picture of a population's mortality.

**MALTHUS, THOMAS R.** (1766-1834). English clergyman and economist famous for his theory (expounded in the "Essay on the Principle of Population") that the world's population tends to increase faster than the food supply and that unless fertility is controlled (by late marriage or celibacy), famine, vice, disease, and war must serve as natural population restrictions. See *neo-Malthusian*.

**MARITAL FERTILITY RATE.** Number of legitimate live births per 1,000 married women aged 15-44 years in a given year.

**MARRIAGE RATE** (or crude marriage rate). The number of marriages per 1,000 population in a given year.

**MATERNAL MORTALITY RATE.** The number of deaths to women due to pregnancy and childbirth complications per 100,000 live births in a given year.

**MEAN AGE.** The mathematical average age of all the members of a population.

**MEDIAN AGE.** The age which divides a population into two numerically equal groups; that is, half the people are younger than this age and half are older.

**MEGALOPOLIS.** A loose term denoting an interconnected group of cities and connecting urbanized bands.

**METROPOLITAN AREA.** A large concentration of population; often an area with 100,000 or more inhabitants and containing at least one city with 50,000 or more inhabitants and those administrative areas bordering the city which are socially and economically integrated with the city.

**MIGRATION.** The movement of people across a specified boundary for the purpose of establishing a new permanent residence. Divided into international migration (migration between countries) and internal migration (migration within a country).

**MOBILITY.** Geographic movement of people.

**MORBIDITY.** The frequency of disease and illness in a population.

**MORTALITY.** Deaths as a component of population change.

**NATALITY.** Births as a component of population change.

**NATURAL INCREASE.** The surplus (or deficit) of births over deaths in a population in a given time period.

**NEGATIVE POPULATION GROWTH.** A net decrease in the size of a population.

**NEO-MALTHUSIAN.** Advocate of restricting population growth through the use of birth control. (Malthus himself did not advocate birth control as a remedy for too-rapid population growth.)

**NEONATAL MORTALITY RATE.** The number of deaths to infants under 28 days of age in a given year per 1,000 live births in that year.

**NET MIGRATION.** The net effect of immigration and emigration on an area's population in a given time period, expressed as increase or decrease.

**NET MIGRATION RATE.** The net effect of immigration and emigration on an area's population, expressed as increase or decrease per 1,000 population of the area in a given year.

**NET REPRODUCTION RATE (NRR).** The average number of daughters that would be born to a woman (or group of women) if she passed through her lifetime from birth conforming to the age-specific fertility and mortality rates of a given year. This rate is similar to the gross reproduction rate, but takes into account that some women will die before completing their childbearing years. An NRR of 1.00 means each generation of mothers is having exactly enough daughters to replace itself in the population. See *gross reproduction rate, total fertility rate,* and *replacement level fertility.*

**NUPTIALITY.** The frequency, characteristics, and dissolution of marriages in a population.

**OLD POPULATION.** A population with a relatively high proportion of middle-aged and aged persons, a high median age, and thus a lower growth potential.

**OUT-MIGRATION.** The process of leaving one subdivision of a country to take up residence in another.

**PARITY.** The number of children previously born alive to a woman; for example, "two-parity women" are women who have had two children up until now, and "zero-parity women" have had no children up until now.

**PERINATAL MORTALITY RATE.** The number of fetal deaths after 28 weeks of pregnancy (late fetal deaths) plus the number of deaths to infants under 7 days of age per 1,000 live births.

**PERIOD ANALYSIS.** Observation of a population in a specific period of time. Such an analysis in effect "takes a snapshot" of a population in a relatively short time period; for example, the U.S. general fertility rate for the year 1975. Most rates derived from period data are period rates. Compare *cohort analysis.*

**POPULATION.** A group of objects or organisms of the same kind.

**POPULATION DENSITY.** Population per unit of land area; for example persons per square mile, or persons per square kilometer of arable land.

**POPULATION DISTRIBUTION.** The patterns of settlement and dispersal of a population.

**"POPULATION EXPLOSION" or "POPULATION BOMB."** Expressions used to describe the 20th century worldwide trend of rapid population growth resulting from a world birth rate much higher than the world death rate.

**POPULATION INCREASE.** The total population increase resulting from the interaction of births, deaths, and migration in a population in a given period of time.

**POPULATION MOMENTUM.** The tendency for population growth to continue beyond the time that replacement level fertility had been achieved because of a relatively high concentration of people in the childbearing years.

**POPULATION POLICY.** Explicity or implicit measures instituted by a government to influence population size, growth, distribution, or composition.

**POPULATION PROJECTION.** Computation of future changes in population numbers, given certain assumptions about future trends in the rates of fertility, mortality, and migration. Demographers often issue low, medium, and high projections of the same population, based on different assumptions of how these rates will change in the future.

**POPULATION PYRAMID.** A special type of bar chart that shows

the distribution of a population by age and sex. Most countries fall into one of three general types of pyramids: (1) Expansive – a broad base, indicating a high proportion of children and a rapid rate of population growth; (2) Constrictive – a base that is narrower than the middle of the pyramid, usually the result of a recent rapid decline in fertility; (3) Stationary – a narrow base and roughly equal numbers in each age group, tapering off at the older ages, indicating a moderate proportion of children and a slow or zero rate of growth.

**POPULATION REGISTER.** A government data collection system in which the demographic and socioeconomic characteristics of all or part of the population are continuously recorded. Denmark, Sweden, and Israel are among the countries that maintain universal registers for demographic purposes – recording the major events (births, marriage, moves, death, etc.) that happen to each individual so that up-to-date information on the whole population is readily available. Other countries, like the U.S., keep partial registers for administrative purposes, such as social security, voter registration, etc.

**POSTNEONATAL MORTALITY RATE.** The annual number of infant deaths at 28 days to one year of age per 1,000 live births in a given year.

**PREVALENCE RATE.** The number of persons having a particular disease at a given point in time per population at risk.

**PRONATALIST POLICY.** The policy of a government, society, or social group to increase population growth by attempting to raise the number of births.

**"PUSH-PULL" HYPOTHESIS.** A migration theory that suggests that circumstances at the place of origin (such as poverty and unemployment) repel or push people out of that place to other places that exert a positive attraction or pull (because of such factors as a high standard of living and job opportunities).

**RATE OF NATURAL INCREASE.** The rate at which a population is increasing (or decreasing) in a given year due to a surplus (or deficit) of births over deaths, expressed as a percentage of the base population.

**REMARRIAGE RATE.** The number of remarriages per 1,000 formerly married (i.e., widowed or divorced) men or women in a given year.

**REPLACEMENT LEVEL FERTILITY.** The level of fertility at which a cohort of women on the average are having only enough daughters to "replace" themselves in the population. By definition, replacement level is equal to a net reproduction rate of 1.00. The total fertility rate is also used to indicate replace-

ment level fertility; in the U.S. today a TFR of 2.1 is considered to be replacement level.

**REPRODUCTIVE AGE.** See *childbearing years.*

**SEX RATIO.** The number of males per 100 females in a population.

**STABLE POPULATION.** A population with an unchanging rate of growth and an unchanging age composition, because of age-specific birth and death rates having remained constant over a sufficiently long period of time.

**STANDARDIZATION** (or age-adjustment). A statistical technique used to enhance the comparison of populations by controlling for the effects of their differing age compositions. Standardization may be used to adjust for other factors as well.

**STATIONARY POPULATION.** A stable population with both a zero growth rate (because the birth rate equals the death rate) and an unchanging age composition.

**SURVEY.** A canvass of selected persons or households in a population usually used to infer demographic characteristics or trends for a larger segment or all of the population. See also *census.*

**SURVIVAL RATE.** The proportion of persons in a specified group (age, sex, health status, etc.) alive at the beginning of an interval (e.g., a 5-year period) who survive to the end of the interval.

**TOTAL FERTILITY RATE (TFR).** The average number of children that would be born alive to a woman (or group of women) during her lifetime if she were to pass through her childbearing years conforming to the age-specific fertility rates of a given year. See also *gross reproduction rate* and *net reproduction rate.*

**URBAN.** In the U.S., "incorporated and unincorporated places of 2,500 or more inhabitants, plus the urbanized zones around cities of 50,000 or more inhabitants," according to the Bureau of the Census. Definitions vary from country to country.

**URBANIZATION.** Growth in the proportion of a population living in urban areas.

**VITAL STATISTICS.** Demographic data on births, deaths, fetal deaths, marriages, and divorces.

**YOUNG POPULATION.** A population with a relatively high proportion of children, adolescents, and young adults, a low median age, and thus a high growth potential.

**ZERO POPULATION GROWTH.** A population in equilibrium, with a growth rate of zero, achieved when births plus immigration equal deaths plus emigration.

# Censuses, Surveys, etc.

**Where Do Data Come From?**

"They must have data on that." How often do we assume that some mysterious "they" have data on whatever subject it is we happen to be researching? As often as not, the desired data do exist. But finding them can be a sometimes frustrating and time-consuming project. And, we have other concerns. If we want data on "single parents," we must stop to think about what we mean. Single parents as household heads? Children under 18? At the state level? No matter what one's subject matter is, there may well be a statistical table out there with just the data needed. Finding it is another matter. Several of the major sources of data for the U.S. are as follows.

**The Decennial Census**

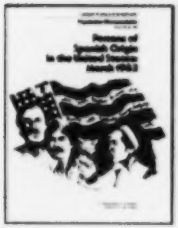
The census is, of course, the prime source of demographic data in the U.S. Much more than a "headcount," the census collects data needed for a wide variety of uses and paints a rich portrait of the social and economic status of the population. Much information that we take for granted is, in fact, rooted in the census. Every year ending in zero, the census asks fundamental questions such as age, sex, race, and marital status of all persons and a series of more detailed questions on migration, income, place of birth, disability, etc., of a sample of one in five households. The content of these "sample questions" is selected by considering the need for the data, the likelihood of collecting usable data, and the opinions of Advisory Committees composed of people from industry, minority groups, marketing, and other relevant fields.

The census is published in many volumes at the state and national level. The main volume, Volume 1, contains data collected of all households in Chapters A and B and sample data on more detailed socioeconomic topics in Chapters C and D. These are followed by special topic Subject Reports devoted to such subjects as

minorities, detailed migration patterns, and childbearing.

The census provides the "benchmark" population measures upon which estimates prepared in non-census years can be based.

**The Current Population Survey**



The Current Population Survey (CPS) is a monthly survey which traces its origin to labor force surveys taken during the Depression. Interviews are conducted each month with about 60,000 U.S. households by the Census Bureau. The survey asks detailed questions on labor force participation for the Bureau of Labor Statistics and is the source of the unemployment figure we see in our newspapers near the end of each month.

CPS findings are published on a continuing basis in the *Current Population Reports* series which can be obtained by subscription. A sample of titles gives an idea of the subject matter covered: *The Fertility of American Women, Marital Status and Living Arrangements,* and *Characteristics of the Population Below the Poverty Level.* These reports provide valuable updates to data which might otherwise only be available during a full census.

**Vital Statistics**

Statistics on births and deaths are among the most fundamental measures of population change. These data are first collected by each state, which are encouraged to use a standard form for the certificates suggested by the Federal government. Data are collected on marriages and divorces as well.

The data are then forwarded to the National Center for Health Statistics (NCHS) which publishes them in a series of national reports. These first appear in *Monthly Vital Statistics Reports* which contains monthly updates and annual summaries as well. Ultimately, these numbers find their way into the large hardbound annual issues of *Vital Statistics of the United States.*

# Population Information Sources

**Population Reference Bureau, Inc.**
777 14th St. N.W., Suite 800
Washington, D.C. 20005
202-639-8040

Since its founding in 1929 the Population Reference Bureau, Inc., has served as an authoritative data resource on U.S. and world population trends, providing its members with factual and up-to-date information of the past, present, and future. PRB's Information Resource Center is one of the world's oldest, most complete population libraries (with 12,000 books and over 450 journals), and its staff, backed by population-related specialists, responds to population-related inquiries by mail, telephone, or in-person visit. PRB's Population Education staff assists the inclusion of population issues in school or college curricula and PRB's Decision Demographics offers personalized, in-depth data and analyses for individual clients seeking professional interpretation of population trends.

PRB's members receive and benefit from a variety of publications and services, receiving annually:

**Population Bulletin,** offering concise analyses four times a year of current population-related issues by recognized authorities;

**The World Population Data Sheet,** an annual wallchart of the latest demographic and socioeconomic statistics for 172 countries;

**The United States Population Data Sheet,** an annual wallchart featuring 24 columns of data for each of the 50 states and the District of Columbia;

**Population Today,** the lively monthly international news magazine of population;

**Interchange,** the quarterly population education newsletter, together with two accompanying modules;

**Population Trends and Public Policy papers** – periodic reports that examine the impact of current demographic trends on public policy.

## Phone Contacts

The telephone numbers listed below are a representative selection of available data sources related to population in one way or other. Phone numbers were accurate as of mid-1988, but tend to change with time. Most entries specialize in either international data or U.S. data, but overlap is not uncommon. Telephone numbers may differ within the same organization for different subject headings.

### U.S.

**General/Media Contacts**

| | |
|---|---|
| U.S. Bureau of Labor Statistics | 202-523-1239 |
| U.S. Census Bureau | 301-763-4040 |
| U.S. Centers for Disease Control | 404-639-3311 |
| Population Reference Bureau, Inc., information services | 202-639-8040 |

### International

**General/Media Contacts**

| | |
|---|---|
| The Population Council | 212-644-1300 |
| Population Information Program | 301-955-8200 |
| The Population Institute | 202-544-3300 |
| United Nations | |
| Population Division | 212-963-3181 |
| Statistical Office | 212-963-8972 |
| United Nations Fund for Population Activities | 212-850-5809 |
| U.S. Census Bureau | 301-763-4086 |
| World Bank | 202-477-1234 |

## U.S.

**Family Planning**

| | |
|---|---|
| Alan Guttmacher Institute | 212-254-5656 |
| | 202-296-4012 |
| U.S. Centers for Disease Control | 404-639-3311 |
| U.S. National Center for Health Statistics | 301-436-8731 |
| Planned Parenthood Federation of America | 212-541-7800 |

**Fertility**

| | |
|---|---|
| U.S. Census Bureau | 202-763-5303 |
| U.S. National Center for Health Statistics | 301-436-8954 |

**Marriage, Divorce, Family**

| | |
|---|---|
| U.S. Census Bureau | 301-763-7987 |
| U.S. National Center for Health Statistics | 301-436-8977 |

**Migration and Urbanization**

| | |
|---|---|
| U.S. Census Bureau | |
| Migration | 301-763-3850 |
| U.S. Immigration and Naturalization Service | 202-633-3059 |
| U.S. Dept. of Agriculture | 202-786-1534 |

**Mortality and Morbidity**

| | |
|---|---|
| U.S. Centers for Disease Control | 404-639-3311 |
| U.S. National Center for Health Statistics | 301-436-8884 |

**Population Estimates and Projections**

| | |
|---|---|
| U.S. Census Bureau | |
| Projections | 301-763-1902 |
| Estimates | |
| state | 301-763-5072 |
| local area | 301-763-7722 |
| national | 301-763-7950 |

**Resources, Environment, and Food**

| | |
|---|---|
| U.S. Dept. of Agriculture | 202-447-4230 |
| Population-Environment Balance | 202-879-3000 |
| National Audubon Society | 212-832-3200 |
| Resources for the Future | 202-328-5025 |
| U.S. Environmental Protection Agency | 202-382-2090 |
| Worldwatch Institute | 202-452-1999 |

**Social and Economic Statistics**

| | |
|---|---|
| U.S. Bureau of Economic Analysis | 202-523-0777 |
| U.S. Census Bureau | |
| Education | 301-763-1154 |
| Housing | 301-763-2873 |
| Income | 301-763-5060 |
| Poverty | 301-763-5790 |
| Race/ethnic data | 301-763-2607 |
| Social indicators | 301-763-1154 |
| The Urban Institute | 202-833-7200 |

## International

**Family Planning**

| | |
|---|---|
| International Planned Parenthood Federation | 212-995-8800 |
| The Population Council | 212-644-1300 |
| U.S. Agency for International Development, Office of Population | 703-875-4402 |
| United Nations Fund for Population Activities | 212-850-5809 |
| U.S. Census Bureau | 301-763-4086 |

**Fertility**

| | |
|---|---|
| United Nations | |
| Population Division | 212-963-3202 |
| Statistical Office | 212-963-4972 |
| U.S. Census Bureau | 301-763-4086 |

**Marriage, Divorce, Family**

| | |
|---|---|
| U.S. Census Bureau, (Women in Development) | 301-763-4221 |

**Migration and Urbanization**

| | |
|---|---|
| Center for Migration Studies | 718-351-8800 |
| Inter-American Development Bank | 202-623-1900 |
| United Nations | |
| Statistical Office | 212-963-4972 |
| Population Division | |
| Migration analysis | 212-963-3217 |
| Urbanization | 212-963-4535 |

**Mortality and Morbidity**

| | |
|---|---|
| United Nations | |
| Population Division | 212-963-4527 |
| Statistical Office | 212-963-4972 |

**Population, Development, and Policy**

| | |
|---|---|
| Overseas Development Council | 202-234-8701 |
| The Population Council | 212-644-1300 |
| Population Crisis Committee | 202-659-1833 |
| The Population Institute | 202-544-3300 |
| World Bank | 202-473-4091 |
| Zero Population Growth | 202-332-2200 |

**Population Estimates and Projections**

| | |
|---|---|
| United Nations (Population Div.) | 212-963-3217 |
| U.S. Census Bureau | 301-763-5964 |
| | 301-763-5072 |
| World Bank | 202-473-3407 |

**Social and Economic Statistics**

| | |
|---|---|
| United Nations | |
| International Labour Organization | 212-697-0150 |
| Statistical Office | 212-963-4562 |
| UNESCO | 212-963-5995 |
| World Bank | 202-473-2939 |

**Resources, Environment, Food**

| | |
|---|---|
| United Nations | |
| Environment Programme | 212-963-8136 |
| Food and Agriculture Org. | 202-653-2402 |
| UNICEF | 212-326-7000 |
| World Resources Institute | 202-638-6300 |
| World Population Society | 202-463-6606 |

## References


### Quick Data Aids

*Statistical Abstract of the United States* (published annually) by the Department of Commerce, Washington, D.C.: U.S. Government Printing Office.

*United Nations Demographic Yearbook* (published annually)

*The United States Population Data Sheet,* (published annually) by the Population Reference Bureau, Washington, D.C.

*World Population Data Sheet* (published annually) by the Population Reference Bureau, Inc., Washington, D.C.

### Population Periodicals

*Current Population Reports,* a voluminous group of population studies published frequently in various series by the U.S. Bureau of the Census. Of particular interest are Series P-20, Population Characteristics; Series P-23, Special Studies; Series P-25, Estimates and Projections of the Population.

*Demography,* a scholarly journal published quarterly by the Population Association of America.

*American Demographics,* a popular monthly magazine with a business orientation published by American Demographics, Inc., Ithaca, N.Y.

*Family Planning Perspectives,* a bimonthly journal published by the Alan Guttmacher Institute.

*Monthly Vital Statistics Report,* published monthly by the National Center for Health Statistics, giving the most current data on U.S. births, deaths, marriages, and divorces.

*People,* a popular magazine published quarterly by the International Planned Parenthood Federation (IPPF), London, on population-related topics.

*Population Index,* a compilation published quarterly for PAA by the Office of Population Research, Princeton University, consisting of abstracts of population-related scholarly articles recently published worldwide, arranged by subject.

*Population Reports,* a bimonthly report of population developments published by the Population Information Program, Johns Hopkins University.

*Population Studies,* a scholarly journal published three times a year by the Population Investigation Committee, London School of Economics, London.

### Suggested General Reading

*The Methods and Materials of Demography* (condensed edition), by Henry S. Shryock and Jacob S. Siegel. Orlando, Fla.: Academic Press, 1976. This book is considered the "Bible" for anyone seriously studying demography.

*Introduction To Population* by Judah Matras. Englewood Cliffs, N.J.: Prentice-Hall, 1977.

*Population* by William Peterson. New York, N.Y.: Macmillan, third edition, 1975.

*Population: Demography and Policy* by Robert Weller and Leon Bouvier. Lavallette, N.J.: St. Martin's Press, 1981.

### Directories of Population Organizations

*Population: An International Directory of Organizations and Information Resources.* Claremont, Calif.: Public Affairs Clearinghouse.

*Directory of the Population-Related Community of the Washington, D.C. Area.* Washington, D.C.: the Population Reference Bureau, Inc., fourth edition, 1981.

*Inventory of Population Projects in Developing Countries Around the World.* New York: United Nations for Population Activities.

## U.S. and Canadian Universities with Graduate Schools Offering Programs of Study with a Concentration in Demography

### United States

Bowling Green State University, Bowling Green, Ohio
Brown University, Providence, R.I.[a]
California, University of, Berkeley, Ca.[a,b]
Chicago, University of, Chicago, Ill.[a]
Columbia University, New York, N.Y.[a]
Cornell University, Ithaca, N.Y.
Duke University, Durham, N.C.[a]
East-West Population Institute, East-West Center, Honolulu, Hi.
Emory University, Atlanta, Ga.
Florida State University, Tallahassee, Fla.[a]
Fordham University, Bronx, N.Y.
Georgetown University, Washington, D.C.[a,b]
Georgia, University of, Athens, Ga.
Harvard University, Cambridge, Mass.[a]
Howard University, Washington, D.C.[a]
Illinois, University of, Urbana-Champaign, Ill.
Iowa State University, Ames, Iowa
Johns Hopkins University, Baltimore, Md.[a]
Kansas State University, Manhattan, Kan.
Kentucky, University of, Lexington, Ky.
Louisiana State University, Baton Rouge, La.
Maryland, University of, College Park, Md.
Massachusetts, University of, Amherst, Mass.
Michigan University of, Ann Arbor, Mich.[a]
Michigan State University, East Lansing, Mich.[a]
Minnesota, University of, Minneapolis, Minn.
Missouri, University of, Columbia, Mo.
New York State University of, Buffalo, N.Y.
North Carolina, University of, Chapel Hill, N.C.
Ohio State University, Columbus, Ohio
Pennsylvania, University of, Philadelphia, Pa.
Pennsylvania State University, University Park, Pa.
Princeton University, Princeton, N.J.[a]
South Carolina, University of, Columbia, S.C.[a]
Southern California, University of, Los Angeles, Ca.
Stanford University, Stanford, Ca.
Texas, University of, Austin, Tex.[a]
Utah State University, Logan, Utah
Washington, University of, Seattle, Wash.[a]
Wisconsin, University of, Madison, Wis.[a]

### Canada

Alberta, University of, Edmonton, Alb.
British Columbia, University of, Vancouver, B.C.
Manitoba, University of, Winnipeg, Man.
Montreal, University of, Montreal, Que.[b]
Toronto, University of, Toronto, Ont.
Western Ontario, University of, London[b]

Note: Unless otherwise noted, school offers Ph.D. in particular departments (e.g., sociology, economics) with a specialization in demography.
[a]School has population center or laboratory, or inter-disciplinary center offering courses in demography.
[b]School offers M.A. and/or Ph.D. in demography.

## Professional Population Associations

These major associations of demographers and population experts hold conferences on population-related subjects and also publish directories of their members.

**Population Association of America (PAA)**
1429 Duke Street
Alexandria, Va. 22311-3402
703-684-1221

**Southern Demographic Association**
Benjamin Bradshaw, Secretary
P.O. Box 29794
San Antonio, Tex. 78229

**International Union for the Scientific Study of Population (IUSSP)**
Rue Forgeur, 5
4000 Liege
Belgium

## Population Reference Bureau, Inc.

### Officers

*Joseph L. Fisher, *Chairman of the Board*
*Thomas W. Merrick, *President*
*Francis Garcia, *Secretary of the Board*
Bert T. Edwards, *Treasurer of the Board*

#### Trustees

Virginia R. Allan
Jodie T. Allen
*Michael P. Bentzen
Nancy Birdsall
Ellen Blalock
*Barry C. Bishop
Rodrigo Botero
Emily DiCicco
Lenneal J. Henderson, Jr.
F. Ray Marshall
Jessica Tuchman Mathews
Anne Firth Murray
Laura Olson
Robert Parke
Peter H. Raven
Charles S. Tidball
Alfred P. Van Huyck
Vivien H. Walton
Bennetta B. Washington
Charles F. Westoff
*Montague Yudelman

Mildred Marcy, *Chair Emerita*
Conrad Taeuber, *Chairman Emeritus and Demographic Consultant*

### Advisory Committee

Samuel Baum
Calvin L. Beale
Donald J. Bogue
Lester R. Brown
Philander P. Claxton, Jr.
Caroline S. Cochran
Mercedes B. Concepcion
Douglas Ensminger
Philip M. Hauser
Carl A. Huether
Jose Ruben Jara
Sam Keeny
Richard K. Manoff
M.A. Sattar
Benjamin Viel
Sloan R. Wayland

*Members of the Executive Committee of the Board of Trustees